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ABSTRACT

The computer-aided listing system developed for the short loan or reserve collection at the University of Lancaster should be applicable to other libraries. Designed for simplicity of operation, the system performs the following functions: (1) provides a master record of all books in the reserve collection at any given time, (2) facilitates the inclusion of additional volumes in the collection, (3) indicates when volumes should be withdrawn from the collection, (4) provides an author catalog of all volumes in the collection, (5) provides a catalog of the collection arranged by the course for which the volume is recommended reading, and (6) provides the teacher who recommended a volume with a record of the number of times it was used while it was held in the reserve collection. Flow charts and listings of the programs are included. (DGC)

ED104335

University of Lancaster Library Occasional Papers, No. 6

COMPUTER LISTING OF A RESERVE COLLECTION

by

B. Gallivan, R. N. Bamber and M. K. Buckland

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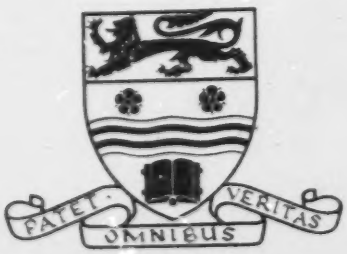

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PREFACE

This report is the sixth in a series of papers which are published at irregular intervals, to make available the results of research work carried out by members of the library staff (see inside back cover for previous titles).

The purpose of the present paper is to describe in detail a computer-aided listing system for a short-loan ("reserve") collection, in the hope that the techniques used (for which we claim no startling originality) may be of use in other libraries, and thus save them the effort of developing their own systems.

A. Graham Mackenzie
Librarian

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1. INTRODUCTION

The steady expansion of student use of libraries obliges librarians to think increasingly in terms of mass provision. If the academic librarian is to maintain a reasonable standard of service (in terms of making and keeping available the material which is sought) then traditional methods must be modified or discarded. In the case of books which teaching staff recommend to students, considerable duplication or severely curtailed loan periods - or some combination of the two - will be needed. A recent article by Shaw has competently reviewed this problem(1) and three preceding Occasional Papers in this series have contained studies of the relationship between demand, duplication, loan period and standards of availability(2-4).

During the past ten years or so, a number of British academic libraries have introduced reserve collections of the type long established in North America.

Typically, teaching staff are asked to notify the librarian of the titles they have recommended to their students; the library staff either locate one or more copies in the library's main collection, or acquire additional copies; these are then placed in a special collection, which is often on closed access. The books are available for loan or consultation for a few hours at a time only.

The logic behind this arrangement is that at times of high demand (e.g. immediately before a seminar or essay date) some kind of rationing is desirable; and that it is better for many borrowers to make brief use of a book than for a few to be granted extended use. The system makes for efficient use of books, in that users are encouraged to read them promptly; 'idle time', when a book is out on loan but not actually being used, is thus reduced to a minimum. Furthermore, unless there is a queue of reservations, a reader who needs a book which is currently on loan will only have a few hours to wait.

Although a reserve collection of this kind is unquestionably very successful in maintaining a high standard of availability, it can be criticised as narrowing students' experience of library use; in addition it brings fairly severe problems. One of these - from the strictly administrative, rather than the educational, viewpoint is maintaining properly updated listings of what can (and should) be a rapidly changing collection. This paper describes the computer-aided system developed by the University of Lancaster Library Research Unit to control and list a 'Short Loan (reserve) Collection', which, with 78,235 issues to less than 3,000 students in the academic year 1970/71, is probably the busiest of its kind in Britain. There is no claim that the system to be described is a significant breakthrough in library automation; on the contrary, it is comparatively simple, and is being described in detail because it is likely to be suitable for adoption by other libraries with similar collections.

In particular, the Lancaster system differs from those recently documented at Columbia(5) and Durham(6). Both of these are considerably more complex: notably they include some elements of an ordering system, and bibliographical descriptions with numerous elements of variable length. The Lancaster system was designed for simplicity of operation on the robust assumptions that the problem was not important enough to warrant much detail, and that a single 80 character punched card could contain sufficient information for the purpose.

Briefly, it is designed to perform the following functions:

i) to provide a master record of all books in the Short Loan Collection at any given time.

ii) to facilitate the inclusion of additional volumes in the Collection.

iii) to indicate when volumes should be withdrawn from the Collection.

iv) to provide an author catalogue of all volumes in the Collection; this is cumulated weekly, and is updated by daily supplements.

v) to provide a catalogue (updated like the above) of the Collection arranged by the course for which the volume is recommended reading (e.g. History 304).

vi) to provide the teacher who recommended a volume with a record of the number of times it has been used while it formed part of the Collection.

2 CONTROL PROBLEMS

This chapter reviews the administrative problems of servicing a reserve collection.

2.1 Title selection

It is the responsibility of those who prescribe reading lists to tell the Library which books they have prescribed. Usually, it is only the lecturers responsible for a course who can decide what books, what parts of books and what periodical articles are going to be necessary.

In order to fulfil adequately its function of book provision, the Library also must have this information. Furthermore, it needs to have it early enough to make available a sufficient number of copies at the time they are needed and for the whole length of time they are needed.

In order to effect a measure of standardization into the methods used to convey this information to the Library, a 5" x 3" Short Loan request card (green card) was designed. This was provided in quantity to Departments and to lecturers, together with an explanation of why it was needed and how it should be used. It proved in practice to be very satisfactory, being convenient and compact both to use and to store.

The cards are received from Departments and the following actions taken (see Chapter 3 for a fuller description of the processes involved):

i) Check that book is in stock; if not, order the required number of copies.

ii) Check for accuracy of author, title, classmark.

iii) Use, where possible, to find the volume on the shelves, in the issue, or elsewhere.

iv) Edit, specify copy number(s) (not the number of copies).
Identical copies are distinguished at Lancaster by quoting the last three digits of the accession number; however, within the Short Loan Collection, they are designated Copy No. 1, Copy No. 2, etc.

v) Make legible, if need be.

vi) Specify course code.

vii) Specify expiry code.

viii) Pass for punching.

ix) Use to verify punching.

x) File for subsequent report of amount of use book has received.

UNIVERSITY LIBRARY, LANCASTER	SHORT LOAN REQUEST CARD	USE ONLY FOR BOOKS (or SERIALS) IN STOCK.
Author	BLOCK CAPITALS PLEASE	CLASSMARK
Title		

TICK SHORT LOAN PERIODS REQUIRED						No. of copies required
MICHAEL-MAS TERM	VACATION	LENT TERM	VACATION	SUMMER TERM	VACATION	
ANY OTHER PERIOD						

SIGNATURE	COURSE NUMBER								
DEPARTMENT							No. of Students		
DATE									

Fig. 2.1 Short Loan Request Card (green card) - front.

2.2 Duplication problem[8]

The problem of duplication and of deciding how many copies of a given book should be made available for students is one of the major difficulties a library has to face. University of Lancaster Library Occasional Paper 2 has considered this problem at length and it may here be convenient to quote from the Introduction to that Paper.

"Even when the librarian knows which titles are likely to be in demand, there remains the problem of estimating how many copies of each will be needed. If too few are provided, then library users will be unable to find the documents which they need, and the library is failing in one of its fundamental tasks; if too many copies are provided then money has been wasted in that the cost of buying, processing and storing the redundant copies could have been more profitably used for other purposes. This problem is especially acute where a number of students are taking the same or similar courses."

The problem thus posed, the Paper then goes on to establish a relationship between duplication, availability and the pattern of requests and to outline practical applications of the formulae developed.

Assisted by the conclusions arrived at in Paper 2 and by regular examination of the book stock and of reservations, in order to establish the pattern of demand, our duplication policy has been made considerably more generous.

Books requiring duplicate copies are identified both by a periodic routine examination of date labels to ascertain the number of issues in a given period, and by a check on the number of reservations made for a particular title. A portion of the book fund has been set aside for the purchase of duplicate copies. This practice, together with the variable loans policy(4), has resulted in books being available to students to an extent which is probably unsurpassed in Britain.

2.3 Overlap

Not infrequently, the same title is recommended by two or even three lecturers giving different courses: an economic history is needed by both Economics and History, or a political philosophy is requested for courses both in Marxism and in Modern Philosophy. The total number of students who are likely to consult each title must therefore be established; our practice is to consult with the lecturers concerned to find any precise similarity between periods when a title must be available for each. It is probable too that whereas a book may be primary material for one course it is of secondary importance, or even merely background material, for another, or it is expected to be in use in different weeks. Where the number of copies in stock is insufficient to meet an expected demand, additional copies are bought.

All copies of a title are listed separately on the print-out, on both the author and the course lists. By this means the author list draws attention to multiple copies of a title which is expected to be in heavy demand, and shows how many are available; the course list provides entries under every course for which the book has been requested. The date labels of the books themselves are also marked with details of all the courses for which they are required, together with the expiry code (see 3.3.1), so that, if a title is no longer needed for one course, the book will remain available for any other courses.

2.4 Vacation borrowing

The period for which a book forms part of the Short Loan Collection may also include a vacation. During this time the book may either be taken away for the whole of the vacation, reverting to Short Loan immediately on its return, or alternatively it may have to remain available on Short Loan. This is often desirable, especially during the Easter vacation when pre-examination revision calls for rapid availability.

2.5 Removal from Short Loan

Books may be removed from the Collection at any time. The green card indicates the length of time they are needed in the Collection, but this is not fixed: it may be as long or as short as a lecturer thinks desirable. The usual period is one or two terms but it may be as short as a week or as long as a year.

Original practice had been to leave books on Short Loan indefinitely - or for the same term of each successive year; this resulted in an aggregation of unused titles. Current practice is to put books on Short Loan for a limited time only, with a maximum period of one year: the onus is now on lecturers to submit a fresh request when the need arises. The return of the green cards, with information on past use, makes this a comparatively simple decision for teachers to make.

2.6 Feedback

We have long felt that lecturers ought to know whether the books they have recommended are being used or not; if this is not done, provision can lose contact with reality and become inappropriate to the real needs of students. Teachers ought also to have the opportunity of reducing or increasing the number of copies they feel they will need. We also consider it desirable to be able to show clearly that the continued inclusion of many recommended titles is unjustified because their use is so small.

The reverse side of the green card is used for this purpose; the actual number of loans for each title is recorded in the appropriate box, term by term, by means of a count of the date stamps on each date label. The return of the green cards to the lecturer reports these figures to him.

This card must be completed correctly and passed to the Service Desk at least a week before the book is required to be available on Short Loan. If the card is presented during the first week of term, the book may not be available in less than ten days. Please always give as much notice as possible.

Number of times this book has been used during

	Michaelmas Term		Vacation		Lent Term		Vacation		Summer Term		Vacation	
1970-71												
1971-72												
1972 73												

In the light of this information do you:-

a) want this book on Short Loan again? .....

b) require additional copies? .....

Fig. 2.2 Short Loan Request Card (green card) - back.

Such feedback stimulates further feedback and we have found that the Library is now told more often and more promptly that a course will not be taught in future, that another lecturer will teach it or that it will be dropped for a term or a session. This systematic involvement of teaching staff in stock control must tend to bring about a better utilisation of resources of books and staff time within the library system.

3 HOW LISTS WERE INTEGRATED WITH CONTROL

The system was designed for the easy addition and removal of books from the Collection. This chapter describes the procedure for adding books to the Collection; the expiry code, by which deletions may be made from the lists at any time, is explained, and the records which we consider it necessary to maintain are outlined.

3.1 Adding books to the Collection

The following is an outline of the procedure followed when books which the Library already possesses are added to the Short Loan Collection.

i) Details of author, title, classmark, number of copies, period to remain on Short Loan, number of students and course code are all provided by the lecturer by means of the Short Loan request card (see Section 2.1). The Library then locates the appropriate volume.

ii) If a copy of the book is not already on Short Loan then the green card is edited for legibility, accuracy and minimal completeness of detail and an expiry code letter is assigned. If a course number is not supplied and cannot readily be ascertained, then up to three of the lecturer's initials may be used instead. This is optional and involves no programming difficulties; it merely collocates the recommended reading of a given teacher within a Department.

iii) The request card then goes for punching and the book for processing (see below).

iv) If the book is already on Short Loan for a different course, or with a different expiry date, then a decision must be made:

a) whether the existing number of copies will be sufficient for the needs of two courses (or three, or four),

b) whether to transfer or purchase additional copies, or

c) what combination of both these courses will be best.

The Short Loan print-out will specify what copies are already serving which courses (but will not show the number of students involved) and copies are numbered 1, 2, 3, etc. If it is decided that an existing copy No. 1 will be used also for a second course, then copy No. 1 is allocated to that course as well; if another copy of the book is added to Short Loan for this second course, then this copy will become copy No. 2. Thus, if the number of students permits, copy No. 1 may serve both ECON109 and HIST211; if there are deemed to be too many students then copy No. 1 serves ECON109 and copy No. 2 serves HIST211. The Author print-out will indicate the number of copies already on Short Loan.

In either event, the request card needs to be edited - course coding checked, terminal expiry code allocated and copy number(s) specified.

v) It may happen that a requested book is already on Short Loan for the same course and with the same terminal date. In this case, query whether this is merely absentmindedness on the part of the requester or whether in fact, additional copies are required.

vi) If the book is not already on Short Loan it should now be reprocessed by the insertion of a Short Loan date label. To the date label should be added the copy number, terminal expiry code and course code. A green spot is stuck to the spine as an outward sign of a Short Loan Collection book.

3.2 Expiry codes

A simple code had already been developed by means of which the period a book should remain in the Collection could easily be written or remembered. Unfortunately, although this code was simple, in its most expanded form it took up to six letters to write and such an amount of space could not be allocated on the punched card. The following single letter code was therefore evolved:

M/L/S indicates end of next Michaelmas/Lent/Summer Term but will be available for long loan during the vacation following.

B/C/D indicates end of next Michaelmas/Lent/Summer Term but will be kept on Short Loan throughout the vacation following.

E/F/G indicates end of next Christmas/Easter/Summer vacation.

A lecturer may thus choose the period which best suits his course; however, it sometimes happens that books are only needed on Short Loan for two or three weeks. If the weeks of a term are numbered 1-9 these numbers may be used as expiry codes.

3.3 Removing books from the Collection

3.3.1 At end of term or end of vacation

By means of the terminal codings, using programme #SLPX, the computer will at a convenient date produce a List of books to come off Short Loan. The arrangement of this is a matter of choice and convenience since the computer can produce it in author alphabetical, course or classified order. At Lancaster it is found convenient to use classmark order since the books are shelved in this order. Using the list, each copy due to come off is inspected. The relevant expiry code and course code (previously written at the top of the date label) is cancelled. The books are matched to their green request cards, and the number of date stamps on the date label is counted and recorded as the number of issues in the appropriate box on the reverse of the request card.

If no expiry and course codes remain at the top of the date label, then this copy is not also serving another course. It may thus be removed from the Collection and reprocessed for the open shelves.

If any expiry and course codes do remain, then this copy is still serving another course. The number of issues is noted but the volume is left on Short Loan.

One element of information is lost here because if a book on Short Loan has served more than one course, it is impossible to determine how many times it has been issued for each course it was serving, since only one total number of issues can be recorded. When the number of issues is reported to each lecturer concerned, it is therefore necessary to point out that other courses were also served.

3.3.2 At other times

In cases where books have been added to the Collection for only a short time, or if for any reason a lecturer decides to remove a certain book from Short Loan, then the relevant punched card need only be removed from the file of punched cards and passed to the computer for 'Deletion' (see Section 3.4.2). The book may be

reprocessed as above and borrowing information recorded and passed back to the lecturer by means of the green card.

3.4 Files and records

3.4.1 Short Loan request cards (green cards)

It has been found useful to maintain three files of green cards:

i) The main file is of cards representing books on Short Loan. The cards are filed in class order in the same way as books on the shelves and, when the books are taken off Short Loan, will be used to report to lecturers the number of times each book has been issued.

ii) An 'in-progess' file of cards for books which are on order or which are already on loan and are being recalled.

iii) A very small and rapidly changing file of cards awaiting punching.

3.4.2 Punched cards

Given a green card, the punch operator punches one 80 column card for each copy specified on each green card, using the layout specified. It might be convenient to pre-print cards with an indication of layout - a common practice in such circumstances. After visual checking, the green cards may be filed and the punched cards passed to the computer for the Short Loan list to be updated. When this was first done, the punched cards were machine or hand sorted and then filed in author/title order for future use. This was because it was considered to be less effort and more reliable to extract a card from this file and use it either for ad hoc deletion or for the modification of a new card for a new addition to the Collection.

However, this proved not to be the case; without exception our card punch operators found in practice that the reverse was true, and that they could more easily and more quickly punch a completely new card than find and use an existing one if they had to make variations of code or course.

3.4.3 Short Loan Lists

a) Author list. This is a list in author/title order, generated by the computer, representing all books on Short Loan at a given time. The

layout can be designed as required: our own proved very satisfactory and is given below:

UNIVERSITY OF LANCASTER SHORT LOAN COLLECTION. DATE____ SHEET NO.____

AUTHOR	TITLE	COPY	CLASSMARK	COURSE CODE
CITRIN J	U.N.PEACEKEEPING	1	QYON	POLI 220
CLAPHAM J	BRITISH ECONOMIC HISTORY	1	MUE	ECON 308
CLAPHAM J	BRITISH ECONOMIC HISTORY	1	MUE	HIST 304
CLAPHAM J	BRITISH ECONOMIC HISTORY	2	MUE	ECON 308
CLAPHAM J	BRITISH ECONOMIC HISTORY	3	MUE	ECON 308
CLAPHAM J	EUROP ECON DEVELOPMENT	1	MRE	HIST 105
CLARK C	GROWTHMANSHIP	1	TAT	ECON 206
CLARK C	GROWTHMANSHIP	2	TAT	ECON 206
CLAUDE I	SWORDS INTO PLOUGHSHARES	1	QYO	POLI 220

The first four 'Clapham' entries illustrate two points:

i) Interpretation of the copy and course data indicates that there are three copies on Short Loan and that copy 1 serves both an Economics and a History course; copies 2 and 3 are serving only the Economics course.

ii) These Clapham entries have not been telescoped into one entry, viz. Clapham J British Economic History 3 copies. This could be done, but it makes control more difficult because it is less clear what is going on. There is quite a good case for being able to produce two versions of the print-out: one primarily for library use with copy numbers, expiry codes and course codes; a second for public use without course codes (because there is a course list) and without expiry codes but with the number of copies shown as a total. But it should be

noted that copies will only be totalled if the cards are identically punched; also, that repeated listing (as with Clapham above) makes items much in demand more readily visible to both students and staff. Note that identical titles are repeated for each "course/copy", i.e. one title serving three courses is listed three times and four copies serving one course are listed four times.

b) Course list. This is arranged numerically by course number within Departments and lists the copies serving each course. A title serving two or more courses will be listed under each.

c) Title list. This has not been considered necessary at present, but it could readily be produced from the same data base with some additional programming, and perhaps more careful editing of title data (e.g. the removal of initial articles).

d) List in classified order. A class order list is not provided for public use, but is produced for Library staff to make easier the removal of large numbers of books from the Collection at the end of each term and vacation.

4 DATA-HANDLING AND LISTING

This chapter discusses the factors affecting the type of lists needed to maintain adequate control over the Collection, and the frequency of their production.

4.1 Collection size

The University of Lancaster Library has developed a book hierarchy, with the loan period of any book depending almost entirely on its popularity. We are thus able to predict that the reserve collection will never contain more than about 3% of the library's total monograph holdings, provided that the criteria for selecting the Collection are not radically altered.

At present, approximately 4,500 items are held in the reserve collection and this number is not expected to increase to more than 8,000 items by the end of the next quinquennium (1977).

When designing the computer programme for the control of the reserve collection the number of items likely to be handled, together with the frequency of handling this data was of great importance. As will be described later, we decided to adopt a scheme using one 80 column card to describe each record, and to use a fixed field format. Both these decisions simplified the programming considerably and at the same time made for easier control of the manual parts of the system as well as permitting a very neat, easily read, computer-produced list.

Since we expect to deal with comparatively few items, the sort programme we have adopted was designed at Lancaster by Mr. D. Nash. It has the advantage of being easy to use since relatively few parameter cards are needed to control it. Most sort packages, on the other hand, have been designed with the general case in mind and are consequently rather awkward to use.

4.2 List updating frequency

After determining the quantity of data to be handled the next most important question was, "How often will this data be handled?". Considerable effort was applied to this problem, since we have three major aspects to consider:

i) The more frequently the files are updated and listed the better the reader is served and the more up-to-date is the information available.

ii) The more frequently the lists are produced, the greater is the amount of computer time used. This could become disproportionately large in comparison to the importance of the system, and could possibly affect future automation plans.

iii) The more frequently lists are produced the greater is the labour required from the library service desk staff.

The use of supplements was initially rejected on the grounds that they make entries twice as difficult to find; as a result we decided to have two major print-outs each week. This was not at all successful, since the computer unit objected to our using so much machine time, and would not guarantee that a 24-hour turn round could be maintained on our work. Consequently, the appearance of a recently-requested item in the reserve collection was often delayed for a few days, a longer period than would have been required under the old manual system.

4.3 Supplements

We decided to try to use daily supplements and to have only one major listing produced each week in term time. To reduce possible confusion the supplements were arranged to have a different appearance from the main list and were positioned at the front of the loose-leaf binders, before the main lists. We also arranged for our main updating job to be run on the day of the week most convenient to the computer unit. This arrangement has proved to be very successful to date; while we tend to use as much computer time as we did when having two major listing jobs run each week, the second major job is now spread over five days instead of concentrated in one.

The supplements have proved to have the extra advantage of allowing for the visual detection of incorrectly punched cards, before they actually become included in the main file (we do not verify our punched cards); they also allow new books to be listed within 24 hours of receiving the original request. If the book is already on loan, however, there is a delay whilst it is being recalled, since a book is only listed after it has actually been placed in the Collection.

5 PRODUCTION OF LISTS

This chapter describes the layout of the files and lists used. The control programmes are also described and flow-charted.

5.1 Punched Card Layout

The reserve collection is intended to contain those items in most demand; we therefore felt it was reasonable to suppose that borrowers would be able to recognize the material they required if it was described in a shortened form. If we could pack all the information required to describe one item in the collection onto one 80 column punched card we felt that everybody would reap a benefit. For example, when adding a book to the reserve collection, the production and handling of one card per record, instead of two or even more, was a real benefit. Since our operators, initially, were library assistants with some typing knowledge but unfamiliar with punched cards and computer based procedures, errors were - and still are - inevitable. However, they are more easily corrected with a one entry, one card system. Another benefit of brevity is seen when the lists are printed out: we are able to use one line per item with a consequent reduction in printing time, cost and bulk.

The result is a very clear, easily read list. Furthermore, the computer maintained files are smaller than if multiple card records were used and consequently are easier to maintain. The only apparent disadvantage of a shortened version of the Author/Title statement is the occasional reduction in the comprehensibility of the title. These factors were carefully considered and the decision was made to use just one 80 column card to describe each item.

The next problem was to define the exact layout of the card.

In order for us to identify each item in the collection it is necessary to provide brief author, title and classmark information about it. Often, two or more copies of the same title are required, and to enable a more efficient control to be maintained over the Collection a copy number is allocated to each book. The course for which the book has been recommended is also required, as is some indication of how long the book is to stay in the Collection. The University administration has for some time been using a 7 character alpha-numeric code to denote each department and each course within a department, e.g.

CLAS 101 = Classics, course 101
POLI 222 = Politics, course 222.

This coding system was suitable for our purposes and so was adopted, thereby maintaining compatability with an existing system. As mentioned earlier (Section 3.2) we devised our own alpha-numeric code to identify different periods for items to remain part of the Collection; this code was not, and is not, intended for student use but is a purely administrative device.

The Layout finally adopted is shown in Fig. 5.1

Cols.	1	-	58	contain the Author/Title information. The author is separated from the title by two spaces.
Cols.	59	-	60	contain the copy number.
Cols.	61	-	71	contain the classmark according to the Bliss Bibliographic Classification used by the Library.
Col.	72			contains the code defining the length of time that the book will remain in the Collection.
Cols.	73	-	79	contain the 4 character department mnemonic plus the 3 character course code.
Col.	80			spare.

This particular allocation of space has proved to be completely acceptable in terms of our particular local requirements. Other users might prefer to allocate fewer characters to the course and classmark fields and more to the author/title field. This is a matter almost entirely dictated by local conditions.

When a book is required for use in the Collection it has to be located and physically processed before it becomes available. The production of the 80 column card is included in the processing phase.

5.2 Magnetic tape files

The 80 column cards are used to update the main file of the Collection, which is held on magnetic tape. At present about 3,000 titles or, allowing for additional copies, 4,500 items are held on the main magnetic tape, in author order and in title and copy number order within

each author. Each individual record is stored on the tape in the same order as it appears on the card. Originally two files were kept, one in author order and the other in course code order, but since the quantity of data we are dealing with is fairly small we find it faster and cheaper to maintain just an author order file and to re-sort this file into course code order whenever we require a course code print-out.

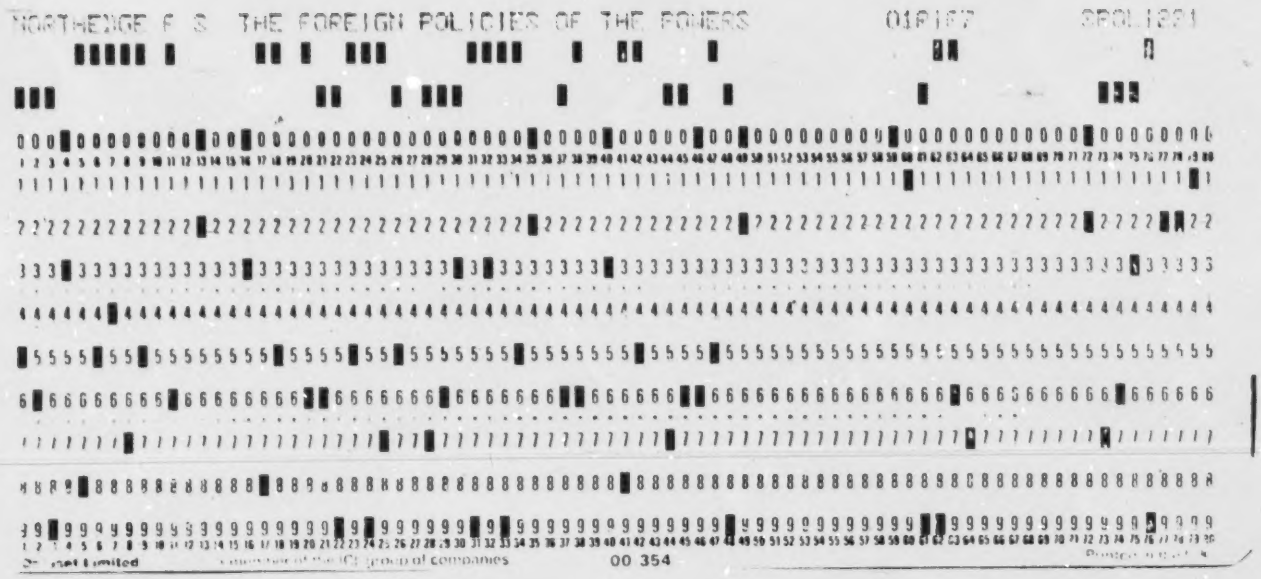
Since all our processing is done on an ICL 1909 computer with 32k of core storage, our magnetic tapes are written to conform to the ICL standard, with the Magnetic Tape House-keeping package being called whenever the tapes are addressed. A block of information on the tape contains 25 records with each record consisting of 6 fixed fields.

5.3 Layout of lists

Examples of the computer-produced lists used in the control of the Collection are shown in figs. 5.2 - 5.6.

Fig. 5.2 shows the author-ordered list. In order to give borrowers warning that certain items will only be available until the end of the current term or vacation, an arrow is prefixed to those items. A new page is started each time the initial letter of the authors' names changes. Originally it was not intended that we would use supplementary lists and in order to reduce the amount of print-out required each time the master file was updated, it was planned that only those letters of the alphabet affected by the updating would be printed out. This facility has not been used. It was found that corrections tended to be widely spread throughout the alphabet consequently comparatively few changes would cause about half the letters of the alphabet to be affected. With six copies of the author list, a considerable time would have been spent interfiling new sheets into the main list. The alternative of using a cumulative supplementary list over a period of six days and then updating and producing a new master list was preferred. As mentioned above, six copies of the author list are produced by the computer for distribution within the library, and since we use 3-part stationery two passes of the main author file are needed to produce this number.

Fig. 5.3 is an example of our course-code ordered print-out. We have found that 3 copies of this listing are sufficient for our present requirements. This list tends to be rather bulky (approximately 3 or 4 times larger than the author-ordered list). Part of the reason for this is that often two sheets are used where one would suffice, because the lecturer requesting books to be placed in the Collection sometimes tells us which



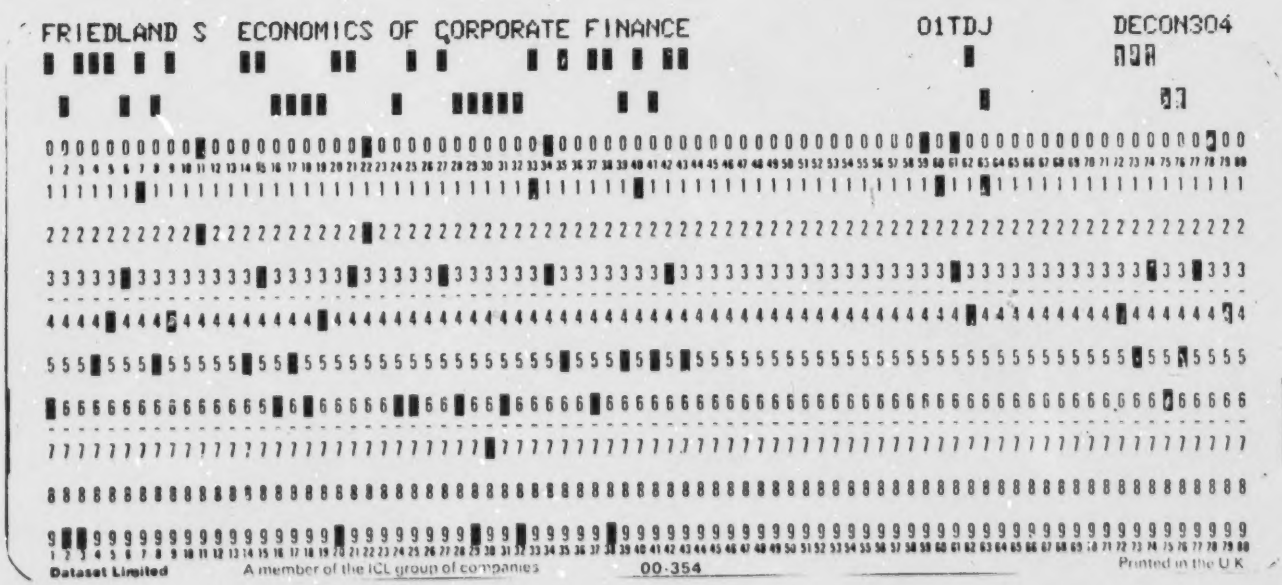


Fig. 5.1 Punched card layout.

UNIVERSITY OF LANCASTER SHORT LOAN COLLECTION. 28/06/72 SHEET NO3

	AUTHOR.	TITLE.	COPY	CLASSMARK	COURSE-CODE
10	WILSON A	MARKETING OF INDUSTRIAL PRODUCTS	1	TJQC	MKTGJM
	WILSON A	MARKETING OF INDUSTRIAL PRODUCTS	1	TJQ	MKT6304
•	WILSON B	PATTERNS OF SECTARIANISM	1	KBQ	SOCL203
	WILSON C	ENGLANDS APPRENTICESHIP	1	HVN.E	HIST8.5
	WILSON C	HISTORY OF UNILVER VOL 1	1	UUN	ECON308
	WILSON C	HISTORY OF UNILVER VOL 2	1	UUN	ECON308
•	WILSON C H	HISTORY OF UNILEVER VOL 1	1	UUN	ECON308
•	WILSON C H	HISTORY OF UNILEVER VOL 2	1	UUN	ECON308
•	WILSON E	TO THE FINLAND STATION	1	RAZ3	HIST105
•	WILSON E	TO THE FINLAND STATION	1	RAZ3	HIST253
•	WILSON E	TO THE FINLAND STATION	2	RAZ3	HIST105
•	WILSON H	LABOUR GOVERNMENT 1964-70	1	HVW	POLI220
•	WILSON H	THE LABOUR GOVERNMENT 1964-70	1	HVW	POLI311
	WILSON M	ANDREW JACKSON THE GREAT COMPROMISER	1	L6	HIST8.7
	WILSON R N	ARTS IN SOCIETY	1	KBKA	SOCL302
	WILSON T	OXFORD STUDIES IN THE PRICE MECHANISM	1	TMG	ECON201
	WINCH D	ECONOMICS AND POLICY	1	TBR	ECON205
	WINDSOR P	CZECHOSLAVAKIA 1968	2	6MKL	POLI106
	WINDSOR P	CZECHOSLAVAKIA 1968	3	6MKL	POLI106
•	WINDSOR P	CZECHOSLAVAKIA 1968	4	6MKL	POLI106
•	WINDSOR P	GERMAN RE-UNIFICATION	1	RD(K)	POLI106
•	WINDSOR P	GERMAN RE-UNIFICATION	2	RD)K)	POLI106
•	WINDSOR P	GERMAN REUNIFICATION	3	RD(K)	POLI106
•	WINDSOR P	GERMANY AND THE MANAGEMENT OF DETENTE	1	RIF(KC)	POLI106
•	WINDSOR P	GERMANY AND THE MANAGEMENT OF DETENTE	2	RIF(KC)	POLI106
•	WISEMAN H	POLITICAL SYSTEMS	1	RC4	POLI221
•	WISKEMANN E	EUROPE OF THE DICTATORS	1	MDP	HIST106
•	WITTFOGEL K	ORIENTAL DESPOTISM	1	RBF	SOCL203
	WOLF C	MILIT INDUST COMPLEXITIES - RAND PAPER	1	69	POLI320
•	WOLFF K	ESSAYS IN SOCIOLOGY AND PHILOSOPHY	1	KA84.09	SOCL203
	WOLFGANG M	SOCIOLOGY OF CRIME AND DELINQUENCY	1	KDQD7	SOCL303
	WOLLEN P	SIGNS AND MEANING IN CINEMA	1	YXPC	SOCL302
•	WOLPE H	CRIT ANALYSIS OF SOME ASPECTS OF CHARISMA	1	K6	SOCL203
•	WOOD R	PHYSIOLOGICAL PLANT PATHOLOGY	1	FUL	BIOLP6A
•	WOODHOUSE A S P	PURITANISM AND LIBERTY	1	HVO.J	POLI201
10	WOODHOUSE A S P	PURITANISM AND LIBERTY	2	HVO.J	POLI201
	WOODWARD E L	THE AGE OF REFORM	1	HVB	ENGL206
	WORKING PAPERS IN CULTURAL STUDIES 1, 1971		1	K6	SOCL302
•	WORSLEY P	THIRD WORLD	1	RC4	POLI210
•	WRIGHT E	FABRIC OF FREEDOM 1763-1800	1	ND	HIST107
•	WRIGHT E	FABRIC OF FREEDOM 1763-1800	2	ND	HIST107
	WRIGHT G	FRANCE IN MODERN TIME	1	HSQ	HIST253
•	WRIGHT Q	STUDY OF WAR	1	RM	POLI322

Fig. 5.2.
Author-ordered List

SOCIOLOGY.

303

AUTHOR - TITLE		COPY	CLASSMARK	EXPIRY-CODE
BECKER H	OUTSIDERS	1	KCCN	D
BECKER H	OUTSIDERS	2	KCCN	D
BECKER H	SOCIAL PROBLEMS - A MODERN APPROACH	1	KDQK	D
BECKER H	THE OTHER SIDE	1	KCCN	D
BECKER H	THE OTHER SIDE	2	KCCN	D
BOURDU D	THE POLICE	1	BUR(S)	G
CLINARD M B	ANOMIE AND DEVIANT BEHAVIOUR	1	KCCN	D
CLOWARD R	DELINQUENCY AND OPPORTUNITY	1	KDQQJ	D
COHEN A	DELINQUENT BOYS	1	KCGN	D
COHEN A K	DELINQUENT BOYS	1	KCGN	D
COHEN A K	DEVIANCE AND CONTROL	1	KCP	D
COHEN S	IMAGES OF DEVIANCE	2	KCCN	D
DINITZ S	DEVIANCE	1	KCCN	G
DOWNES D	DELINQUENT SOLUTION	1	KDQQJ	D
GIALLOMBARDO R	JUVENILE DELINQUENCY, A BOOK OF READINGS	1	KDQQJ7	D
GIBBONS D	SOCIETY CRIME AND CRIMINAL CAREERS	1	KDQQ	D
LEMERT E	HUMAN DEVIANCE SOCIAL PROB & SOCIAL CONTROL	1	KCCN	G
LEMERT E	SOCIAL PATHOLOGY	1	KDQK	D
MANNHEIM H	COMPARATIVE CRIMINOLOGY VOL 1	1	KDQQ	D
MANNHEIM H	COMPARATIVE CRIMINOLOGY VOL 2	1	KDQQ	D
MATZA D	BECOMING DEVIANT	1	KCCN	G
MATZA D	DELINQUENCY AND DRIFT	1	KDQQJ	D
MATZA D	DELINQUENCY AND DRIFT	1	KDQQJ	D

Fig. 5.3. Course-code ordered list

SUPPLEMENTARY LIST OF RECENT ADDITIONS. THE MAIN LIST FOLLOWS.

ABERCROMBIE D	ELEMENTS OF GENERAL PHONETICS	01WA SENGL602
ABERCROMBIE D	ELEMENTS OF GENERAL PHONETICS	01WR SENGL316
ACKLEY G	MACROECONOMIC THEORY	*03TAV DECON201
ALIENDOERFER C	PRINCIPLES OF MATHEMATICS 3RD ED	01AM DMATHAT
ALLENDOERFER C	PRINCIPLES OF MATHEMATICS 3RD ED	02AM DMATHAT
AMERICAN ANTHROPOLOGIST	VOL 67 NO 5 PT 2 1965	01KEA CLING151
AMERICAN ECON ASSOC	READINGS ETC IN INTERNATIONAL TRADE	01THU7 DECON303
AMERICAN ECONOMIC ASS	READINGS IN BUSINESS CYCLE THEORY	01TAV DECON201
AMERICAN ECONOMIC ASS	SURVEYS OF ECONOMIC THEORY VOL 1	01T DECON303
AMERICAN ECONOMIC ASS	SURVEYS OF ECONOMIC THEORY VOL 1	02T DECON303
BACHRACH P	THEORY OF DEMOCRATIC ELITISM	01RCR CPHIL311
BACHRACH P	THEORY OF DEMOCRATIC ELITISM	02RCR CPHIL311
BACKER H	MODERN ACCOUNTING THEORY	01TO DF.CL301
BACKER H	MODERN ACCOUNTING THEORY	02TO DF.CL301
BARRY B	SOCIOLOGISTS ECONOMISTS AND DEMOCRACY	01RBR CPHIL311
BARRY B	SOCIOLOGISTS ECONOMISTS AND DEMOCRACY	02RBR CPHIL311
BERLIN B	BASIC COLOUR TERMS	01WFS CLING151
BOTTOMORE T	ELITES AND SOCIETY	01KCNE CPHIL311
BOTTOMORE T	ELITES AND SOCIETY	02KCNE CPHIL311
BOYD H	WHAT BIG AGENCY MEN ETC	01QUNCOPY MMKTGRJL
BRAAM I S	DEVELOPING EFFICIENT READING	01JKDF CENGLENG
BRENNAN D G	ARMS CONTROL, DISARM AND NAT SECURITY	02RPN LPOLI324
BRETT G	HISTORY OF PSYCHOLOGY	01I3R MM.SC
BRUCHEY S	ROOTS OF AMERICAN ECONOMIC GROWTH	01NEF DECON310
CLOCHE P	THEBES DE BEOTIE	01LRPS ECLAS231
CLOCHE P	THEBES DE BEOTIE	01LRPS ECLAS290
CONKLIN H C	HANUNOO COLOUR CATEGORIES	01K6 MENGLGNI
CRONIN T E	THE PRESIDENTIAL ADVISORY SYSTEM	01RN(R).EV EPOLI313
DORFMAN R	PRICES AND MARKETS	02TAD EECON305
DUE J F	INTERMEDIATE ECONOMIC ANALYSIS	01TAB DECON201
FARMER W R	CHRISTIAN HISTORY AND INTERPRETATION	02PN.AYH MR.ST001
FREUD S	THE FUTURE OF AN ILLUSION	01AJA LR.STRT
FREUD S	TOTEM AND TABOO	01KBD LR.STRT
FREUND J	MODERN BUSINESS STATISTICS	02TDMS DMKTGPWK
FRIES C C	LINGUISTICS AND READING	01ZDB CENGLENG
GILCHRIST D T	THE GROWTH OF SEAPORT CITIES	01TNN(R)S MECON310
GLASS B	FORERUNNERS OF DARWIN	01BO MM.SC
GORDON M R	CONFLICT AND CONSENSUS IN LABOUR'S FOR POLICY	01MVT.D SPOLI311
GREENE J C	THE DEATH OF ADAM	01E3 SM.SC
HALLIDAY M A K	THE LINGUISTIC SCIENCES AND LANG TEACHING	01WR MENGLPJD
HAMMEL E A	FORMAL SEMANTIC ANALYSIS	01KEA *CLING151
HARRISON M	TRADE UNIONS AND THE LABOUR PARTY	01RD(EA).YH SPOLI311
HERRNSTEIN R J	SOURCE BOOK IN HISTORY OF PSYCHOLOGY	01I72 LM.SC
HIRST P J	THE PROBLEMS OF PERCEPTION	01AWB MPHIL103

Fig. 5.4.

Author Supplement

SUPPLEMENTARY LIST OF RECENT ADDITIONS. THE MAIN LIST FOLLOWS.

CLAS231	CLOCHE P THEBES DE BEOTIE	01LBPS	E
CLAS231	JONES A H M SPARTA	01LBPM	E
CLAS231	PARKE H W DEVELOPMENT OF THE SECOND SPARTAN EMPIRE	01XDA	E
CLAS231	SMITH R E THE OPPOSITION TO AGESILAUS' FOREIGN POLICY	01LA	E
CLAS290	CLOCHE P THEBES DE BEOTIE	01LBPS	E
CLAS290	JONES A H M SPARTA	01LBPM	E
CLAS290	PARKE H W DEVELOPMENT OF THE SECOND SPARTAN EMPIRE	01XDA	E
CLAS290	SMITH R E THE OPPOSITION TO AGESILAUS' FOREIGN POLICY	01LA	E
ECON101	MAJUMDAR T THE MEASUREMENT OF UTILITY	01TAM	E
ECON201	ACKLEY G MACROECONOMIC THEORY	01TAY	D
ECON201	AMERICAN ECONOMIC ASS READINGS IN BUSINESS CYCLE THEORY	01TAY	D
ECON201	DUE J F INTERMEDIATE ECONOMIC ANALYSIS	01TAZ	D
ECON301	SHOUP R PUBLIC FINANCE	02TTF	D
ECON303	AMERICAN ECON ASSOC READINGS ETC IN INTERNATIONAL TRADE	01TMUZ	D
ECON303	AMERICAN ECONOMIC ASS SURVEYS OF ECONOMIC THEORY VOL 1	01T	D
ECON303	AMERICAN ECONOMIC ASS SURVEYS OF ECONOMIC THEORY VOL 3	02T	D
ECON305	DOREMAN R PRICES AND MARKETS	02TAD	E
ECON310	BRUCHEY S ROOTS OF AMERICAN ECONOMIC GROWTH	01NFF	D
ECON310	GILCHRIST D T THE GROWTH OF SEAPORT CITIES	01TNH(813	M
ECON310	TAYLOR G R THE TRANSPORTATION REVOLUTION	01NF F	D
ECON321	NEEDHAM D READINGS IN INDUSTRIAL ORGANIZATION	01TD7	D
ENGL305	JOHNSON S WORKS. YALE ED. VOL 1	01YGW	M
ENGL305	JOHNSON S WORKS. YALE ED. VOL 2	01YGW	M
ENGL305	JOHNSON S WORKS. YALE ED. VOL 3	01YGW	M
ENGL305	JOHNSON S WORKS. YALE ED. VOL 4	01YGW	M
ENGL305	JOHNSON S WORKS. YALE ED. VOL 5	01YGW	M
ENGL305	JOHNSON S WORKS. YALE ED. VOL 6	01YGW	M
ENGL305	JOHNSON S WORKS. YALE ED. VOL 8	01YGW	M
ENGL314	ABERCROMBIE D ELEMENTS OF GENERAL PHONETICS	01WR	S
ENGL314	MALMBERG B PHONETICS	01WRC	S
ENGL402	ABERCROMBIE D ELEMENTS OF GENERAL PHONETICS	01WR	S
ENGL402	MALMBERG B PHONETICS	01WRC	S
ENGLCNC	BRAAM I S DEVELOPING EFFICIENT READING	01JKDF	C
ENGLCNC	FRIES C C LINGUISTICS AND READING	01ZDR	C
ENGLCNC	VYGOTSKY L S THOUGHT AND LANGUAGE	01IVF	C
ENGLGNL	CONKLIN H C HANUNOO COLOUR CATEGORIES	01KA	M
ENGLMRO	MCINTOSH A PATTERNS OF LANGUAGE	02WAR	M
ENGLPJP	HALLIDAY M A K THE LINGUISTIC SCIENCES AND LANG TEACHING	01WR	M
ENGLPJP	LEECH G ENGLISH IN ADVERTISING	01VAS	L
F.CL301	BACKER M MODERN ACCOUNTING THEORY	01TO	D
F.CL301	BACKER M MODERN ACCOUNTING THEORY	02TO	D
F.CLMJE	INST OF CHARTERED ACCOUNTANTS SURVEY OF PUB ACS 1969-70	01OUVCOPY	L
GERMDAS	MANN T GESAMMELTE WERKE 6	01XUU M282	M
GERMDAS	MANN T TONIO KROGER	01OUVCOPY	M

Fig. 5.5.

Course-code supplement

MVO.J	WOODHOUSE A S P PURITANISM AND LIBERTY	02	POLI201
MVO.J	WOODHOUSE M S P PURITANISM AND LIBERTY	01	POLI201
MVO.J	WOODHOUSE M S P PURITANISM AND LIBERTY	02	POLI201
MVO.P	MATHIAS P THE FIRST INDUSTRIAL NATION	01	ECONJVM
MVB.P	POLLARD S GENESIS OF MODERN MANAGEMENT	01	ECON308
MVT	AMERY L S MY POLITICAL LIFE VOLS 2,3	01	HIST059
MVT	BULLOCK A LIFE AND TIMES OF ERNEST BEVIN VOL. 1	01	HISTGAP
MVT	JONES T A WHITEHAL DIARY VOL. 2	01	HISTGAP
MVT.C	YOUNGSON BRITAIN'S ECONOMIC GROWTH	01	HISTS.9
MVT.J	SNOWDEN P AN AUTOBIOGRAPHY VOL 2	01	HISTGAP
MVUM	CITRINE W M MEN AND WORK	01	HISTS.9
MVUM	MIDDLEMAS K BARNES J BALDWIN	01	HIST203
MVUM.E	BRAILSFORD H N LIVING WAGE	01	HISTS.9
MVUM.J	BARRETT R NINETEEN THIRTY ONE - POLITICAL CRISIS	01	HISTGAP
MVUM.J	SKIDELSKY R POLITICIANS & THE SLUMP	01	HISTGAP
MVVA9	HIST.OF 2ND W.WAR U.K.MILITARY SER.GRAND STRAT.VOL 5	01	POLI327
MVV69	HIST.OF 2ND W.WAR U.K.MILITARY SERIES-GRAND STRATEGY VOL 6	01	POLIRPB
MVVA9	HISTORY OF 2ND WORLD WAR - GRAND STRATEGY VOLS. 2 & 5	01	POLI321
MVVA9	OFFICIAL HISTORY OF 2ND WORLD WAR - GRAND STRAT. VOL. 6	01	POLI327
MVVP	MACMILLAN H TIDES OF FORTUNE	01	POLI327
MVVP.D	FITZSIMONS M A FOREIGN POLICY OF BRITISH LAB. GOV.	01	POLI221
MVW	EDEN A FULL CIRCLE	01	POLI327
MVW.D	NUTTING A NO END OF LESSON	01	POLI327
MVW.J	BOGDANOR V AGE OF AFFLUENCE	01	POLI102
MVWD	NORTHEDGE F S BRITISH FOREIGN POLICY	01	POLI327
MWBM	MELLING E KENTISH SOURCES 6 - THE POOR	01	HIST503
MWSD	SMITH A B LAND & POLITICS IN THE ENGLAND OF HENRY8TH	01	HISTS.3
MXBH	FLEMING D H MARY QUEEN OF SCOTS	01	HISTMHM
ND.D	VAN ALSTYNE R EMPIRE & INDEPENDENCE	01	HIST107
NDC	GREENE J THE QUEST FOR POWER	01	HIST107
NDC	KNOLLENBERG,B ORIGINS OF THE AMERICAN REVOLUTION	01	HIST107
NDMS	BAILYN B PAMPHLETS OF THE AMERICAN REVOLUTION	01	HIST107
NEI	CURTI M GROWTH OF AMERICAN THOUGHT	01	HIST104
NEI	JAHER F C DOUBTERS AND DISSENTERS' CATA.THOUGHT IN U.S.	01	HIST104
NEO	BENSON L CONCEPT ON JACKSONIAN DEMOCRACY	01	LIB.CP
NEO	BENSON L CONCEPT ON JACKSONIAN DEMOCRACY	01	HIST204
NEO	SCHLESINGER AGE OF JACKSON	01	HIST204
NH.F	HAYS S P THE RESPONSE TO INDUSTRIALISM	01	HIST104
NHK.I	COMMAGER H AMERICAN MIND	01	HIST104
NHQ.V	THOMPSON SIR R NO EXIT FROM VIETNAM	01	POLI221
OIT	FITZGERALD C P THE BIRTH OF COMMUNIST CHINA	01	HIST105
OIT	FITZGERALD C P THE BIRTH OF COMMUNIST CHINA	02	HIST105
OIT	MCALEAVY H THE MODERN HISTORY OF CHINA	01	HIST105
OIT	MCALEAVY H THE MODERN HISTORY OF CHINA	02	HIST105
OITK.J	LOH P THE KUOMINTANG DEBACLE OF 1949	01	HIST106
OITK.J	SNOW E RED STAR OVER CHINA	01	HIST106
OITR	JOHNSON C A PEASANT NATIONALISM & COMMUNIST POWER	01	HIST106
OITR.D	BUCHAN A CHINA AND THE PEACE OF ASIA	01	POLI221
OITR.D	DUTT V P CHINAS FOREIGN POLICY	01	POLI221
OITR.D	KAIB M I DRAGON IN THE KREMLIN	01	POLI221
OITR.H	HSIEH A L COMM. CHINAS STRAT. NUCLEAR PRA	01	POLI221
OJ	BEASLEY W G THE MODERN HISTORY OF JAPAN	01	HIST105
OJ	BEASLEY W G THE MODERN HISTORY OF JAPAN	02	HIST105
OJ	STORRY R HISTORY OF MODERN JAPAN	01	HIST105
OJ	STORRY R HISTORY OF MODERN JAPAN	02	HIST105
OJT.J	TOTTEN G O DEMOCRACY IN PREWAR JAPAN	01	HIST106
OJTH	MORRIS I JAPAN 1931 TO 1945	01	HIST105

Fig. 5.6.

Classmark-ordered list

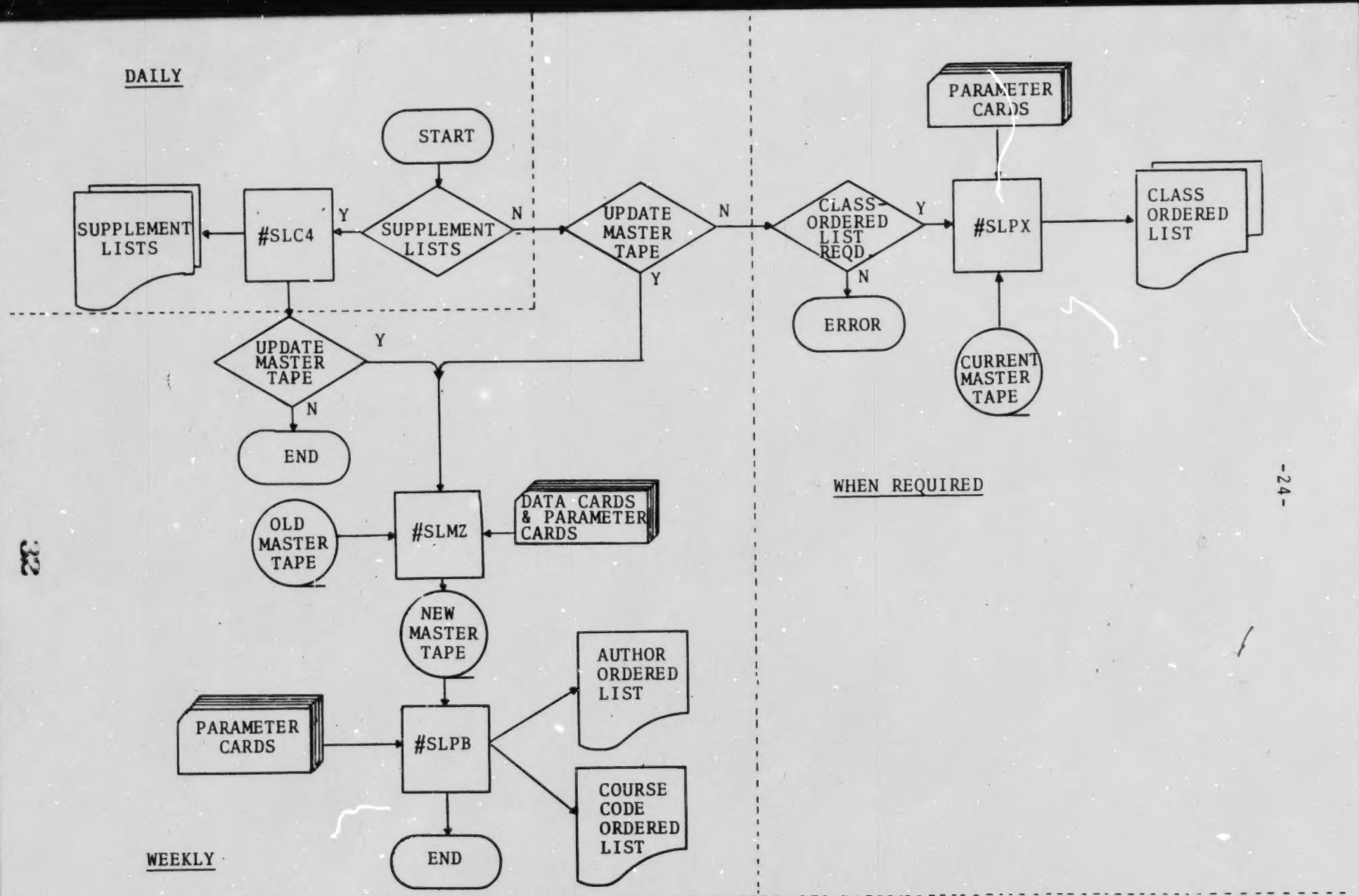


Fig. 5.7. OVERALL SYSTEM FLOW DIAGRAM

course the books are to serve and sometimes does not. When this information is not available, his initials are used instead, thus causing an apparent extra course to be defined. Moreover, each course starts on a new sheet.

Figs. 5.4 and 5.5 are examples of the supplementary lists in author and course-code order respectively. These lists are deliberately made to have a different appearance to that of the main lists in order to draw attention to the fact that they are merely supplements to the main lists.

Fig. 5.6 is an example of the classmark-ordered listing. This listing is used at the end of a main period, for example, the end of a term or a vacation, to indicate which books should be removed from the Collection, which is kept in classmark order.

5.4 The Control Programmes

In order to control the Collection four basic programmes are used. These are:

#SLC4 (used to provide daily supplements)
#SLMZ (used to update the master tape file)
#SLPB (used to print the author and course lists)
#SLPX (used to print the classmark-ordered list)

The overall flow diagram of the present system is shown in Fig. 5.7 together with an indication of the frequency of use of the various parts of the system.

A detailed description of each of the four programmes at flow diagram level follows. A detailed listing of each programme is presented in Appendix A.

5.4.1 #SLC4

This is the most frequently used programme, normally being used once per working day in term time to produce a cumulative supplement. During vacations it is used when the Service Desk staff consider it necessary.

The programme serves two purposes:

i) It provides immediate, up-to-date information about the Collection.

ii) It allows a visual check to be made on each record. Our cards are not verified and as a result punching errors tend to be overlooked. However, the fixed-field layout of the printed supplement list makes visual checking a very simple matter. Corrections can then be made to the punched cards before they are used to update

the main magnetic tape file.

Each day a batch of request cards is processed. The production of 80 column punched cards is part of the operation. These new cards are added to the cards produced during previous days of the current week. The programme #SLC4 is loaded and reads in all the punched cards.

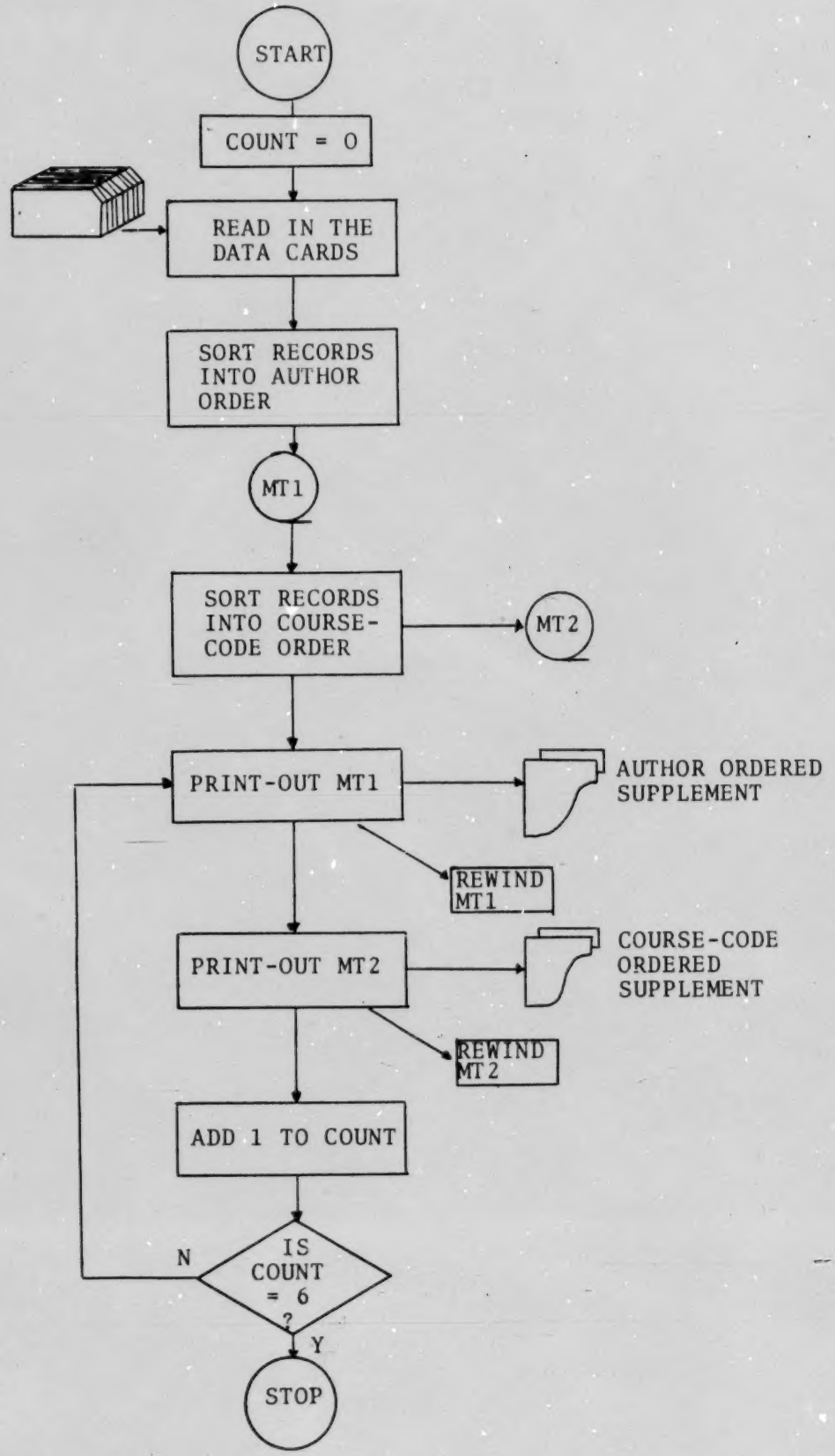
The records on the cards are sorted into author-title-copy order and stored on a magnetic tape. These sorted records are next re-sorted into course-code order, and author-title-copy order within this and stored on another magnetic tape. The author-ordered tape is printed out and whilst this tape is being rewound the course-code ordered tape is printed out. This printing procedure is repeated five more times to produce six copies of each list. Because of our local computer conditions it is faster and more convenient to print out six top copies of each supplement list rather than to use 3-part stationery, which would have to be specially loaded.

5.4.2 #SLMZ

#SLMZ is the programme that performs all the file house-keeping we require. It has been designed to accept unsorted records on punched cards and to sort them into order before merging them with the existing file. It is also possible to remove certain individual records from the master file using the same card that was used to input the record to the file in the first place. The facility of removing whole batches of records from the file is also available. Individual records are removed from the main file either when they have been incorrectly entered in the first place, or when an item is specially removed from the Collection (usually at the request of the member of staff who originally wanted it put into the Collection). Batches of records are removed from the Collection at the end of a term or vacation. The specially provided 'expiry code' is used for this operation.

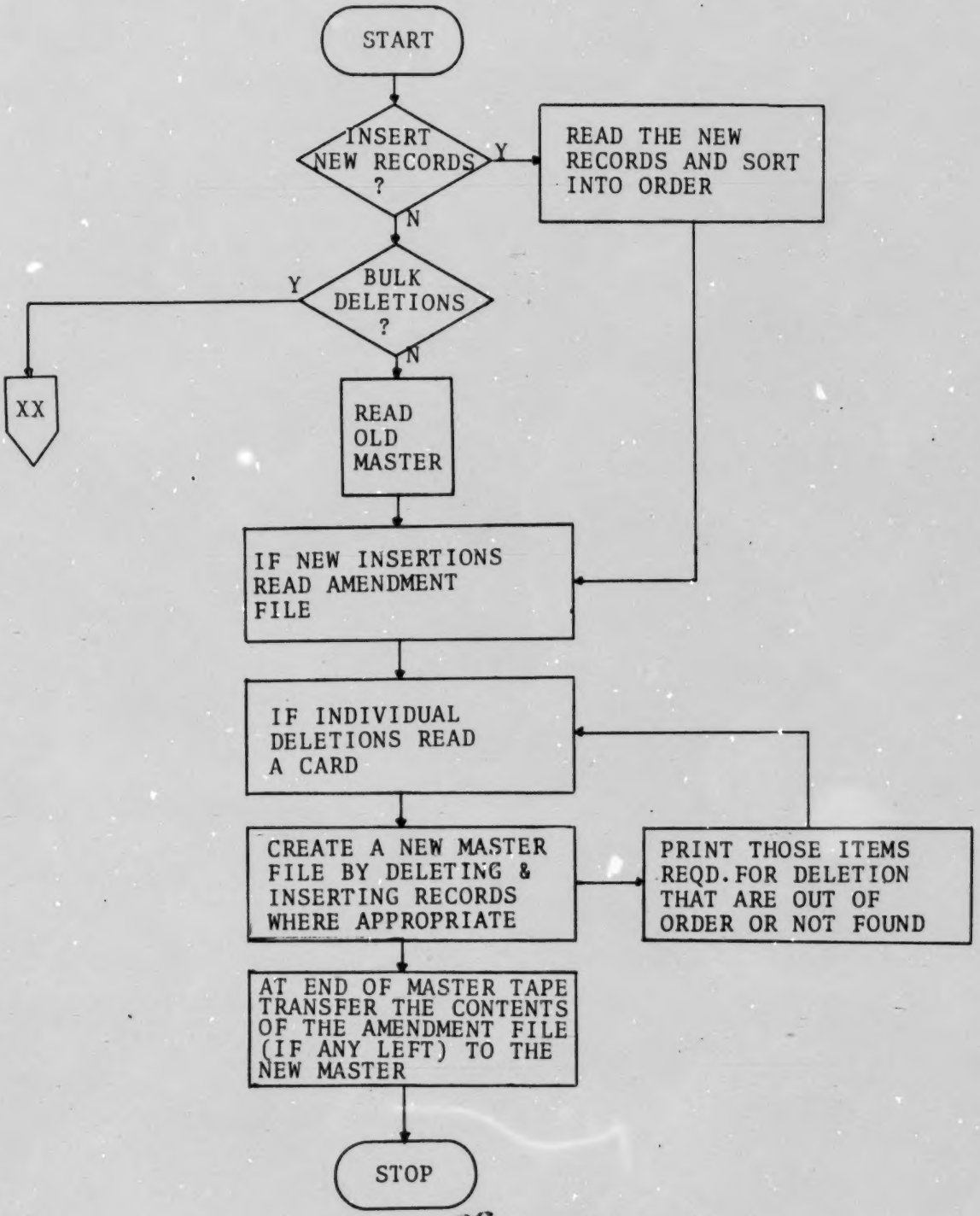
Note It is possible during the same run both to insert and to delete records, using cards. It is also possible simultaneously to delete records by means of individual cards as well as to remove batches of records by means of the expiry code. The cards used to delete individual records are frequently presented either in an incorrect order or for a record which does not exist in the magnetic tape file. These cards are printed out but are otherwise ignored and the job proceeds to the next record.

FLOW DIAGRAM OF #SLC4

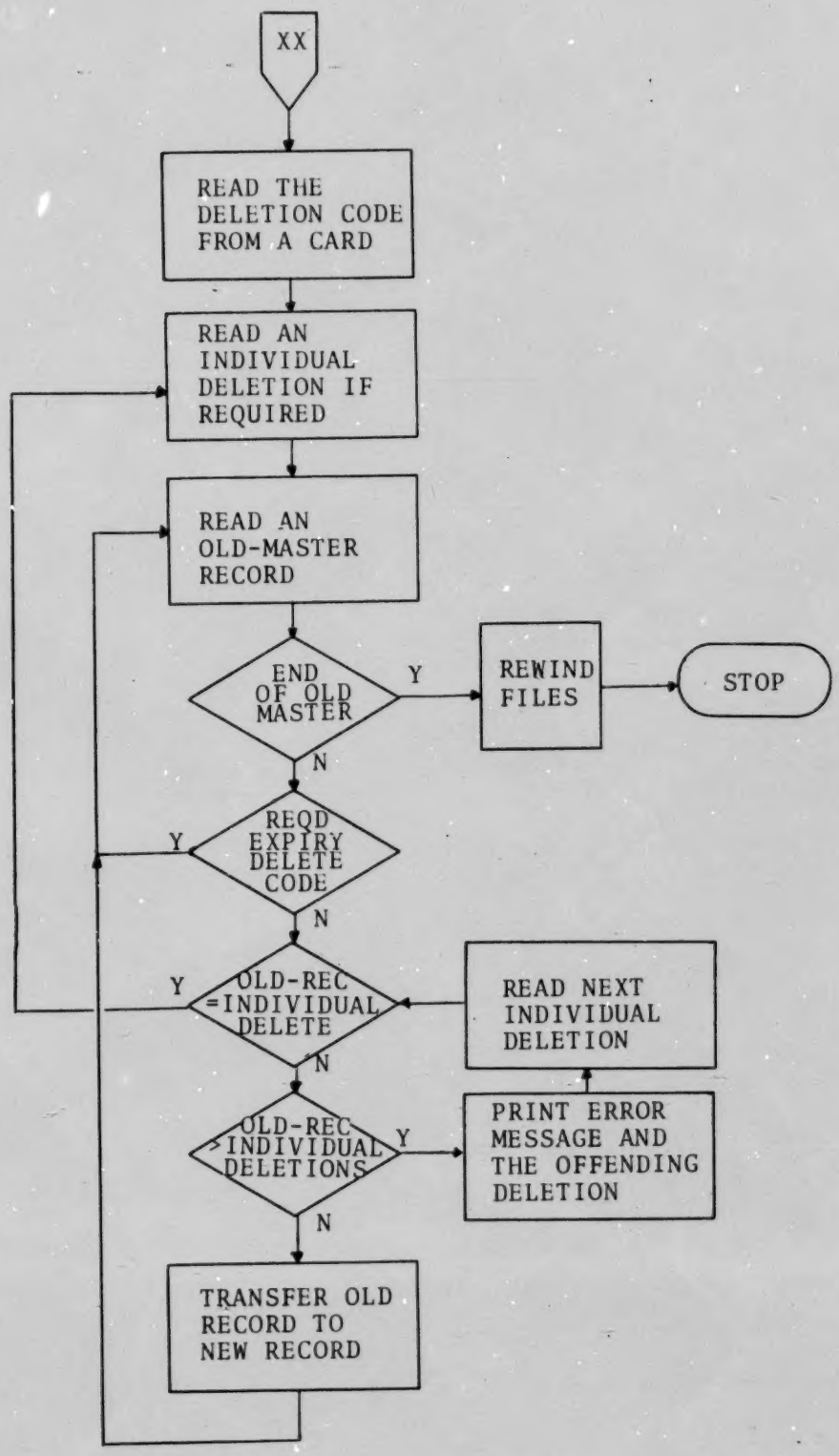


(The magnetic tapes are not usually saved)

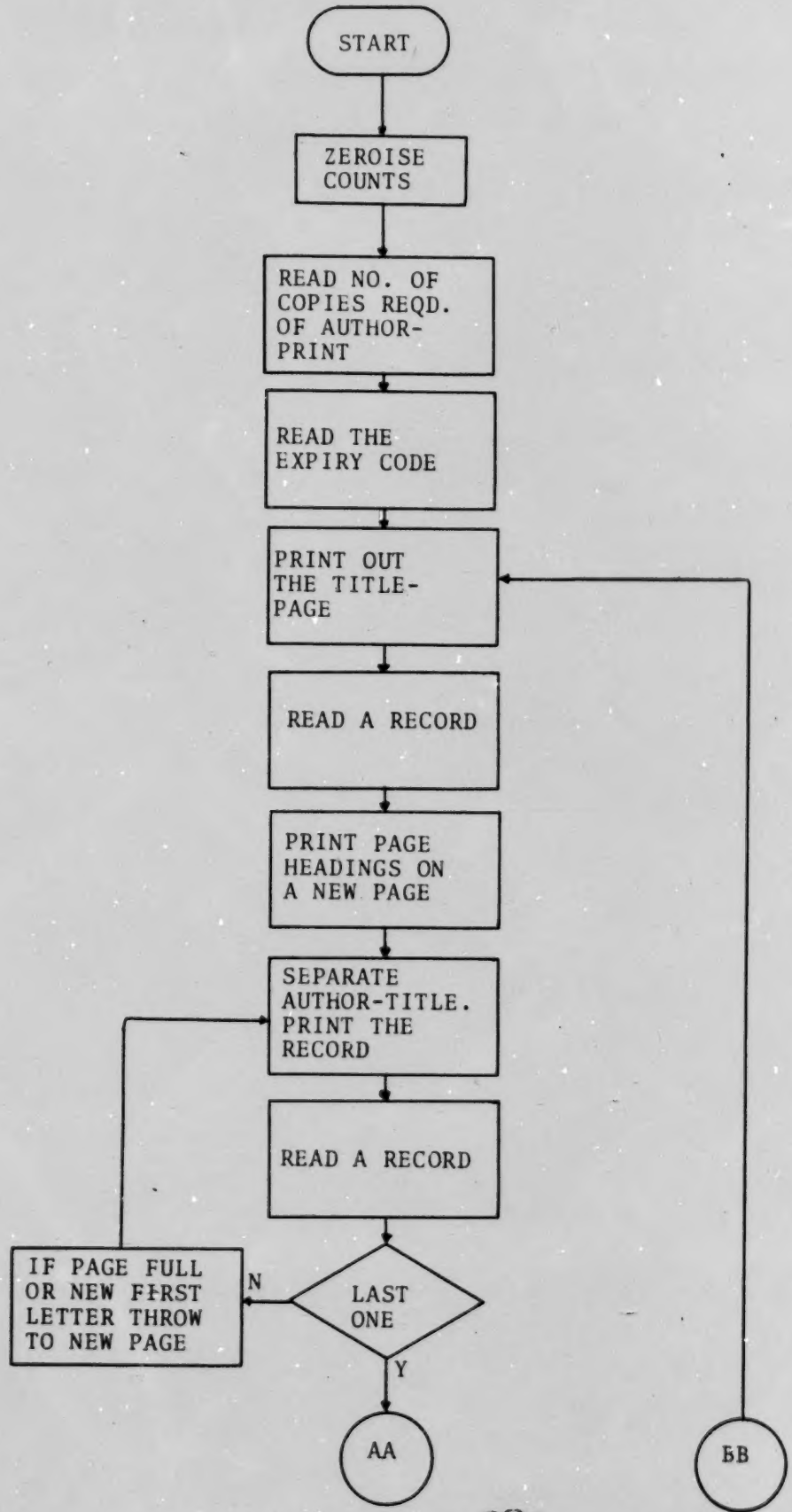
FLOW DIAGRAM OF #SLMZ


START
INSERT NEW RECORDS ?
Y
READ THE NEW RECORDS AND SORT INTO ORDER
N
BULK DELETIONS ?
Y
N
XX
READ OLD MASTER
IF NEW INSERTIONS READ AMENDMENT FILE
IF INDIVIDUAL DELETIONS READ A CARD
CREATE A NEW MASTER FILE BY DELETING & INSERTING RECORDS WHERE APPROPRIATE
PRINT THOSE ITEMS REQD. FOR DELETION THAT ARE OUT OF ORDER OR NOT FOUND
AT END OF MASTER TAPE TRANSFER THE CONTENTS OF THE AMENDMENT FILE (IF ANY LEFT) TO THE NEW MASTER
STOP

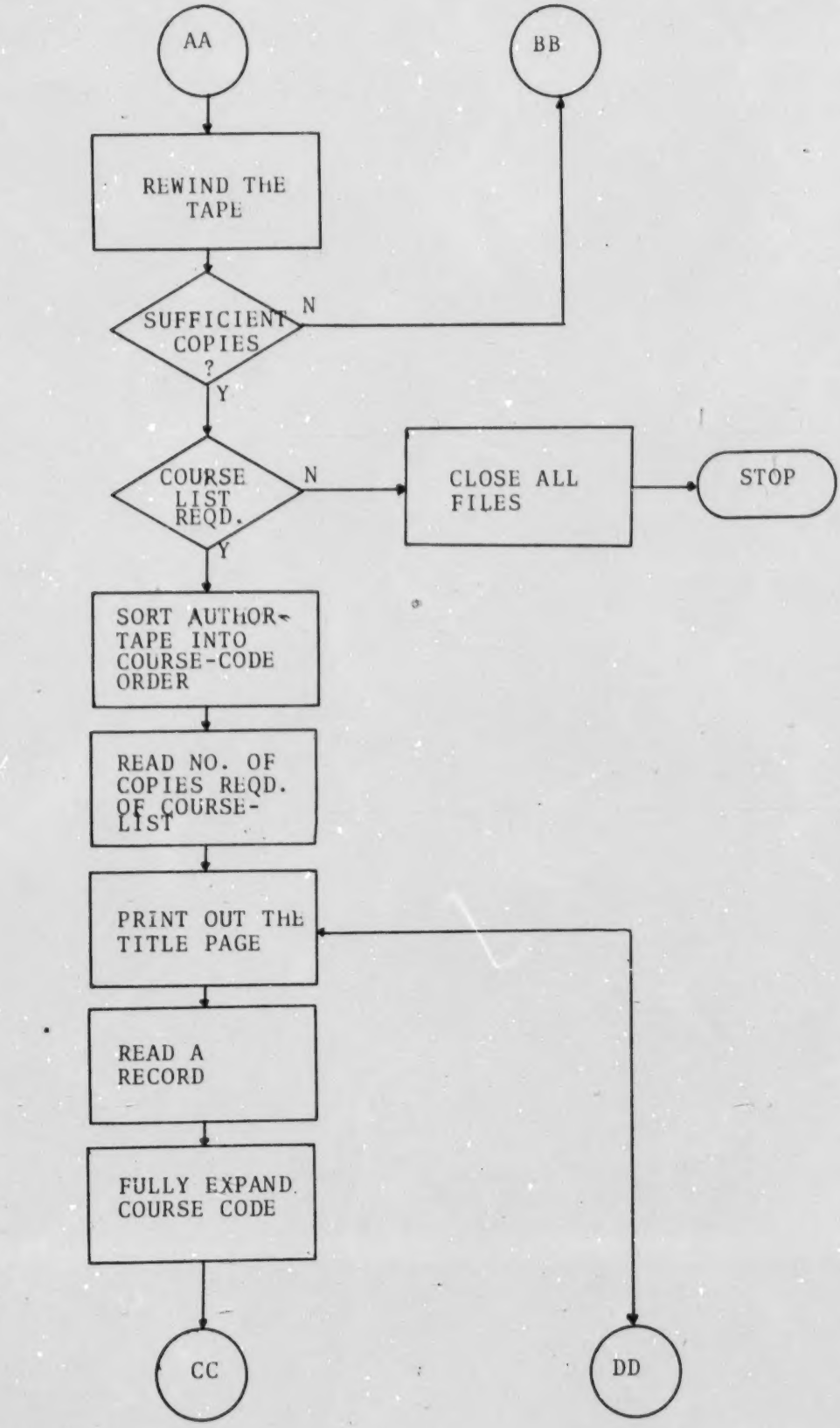
FLOW DIAGRAM OF #SLMZ (continued)



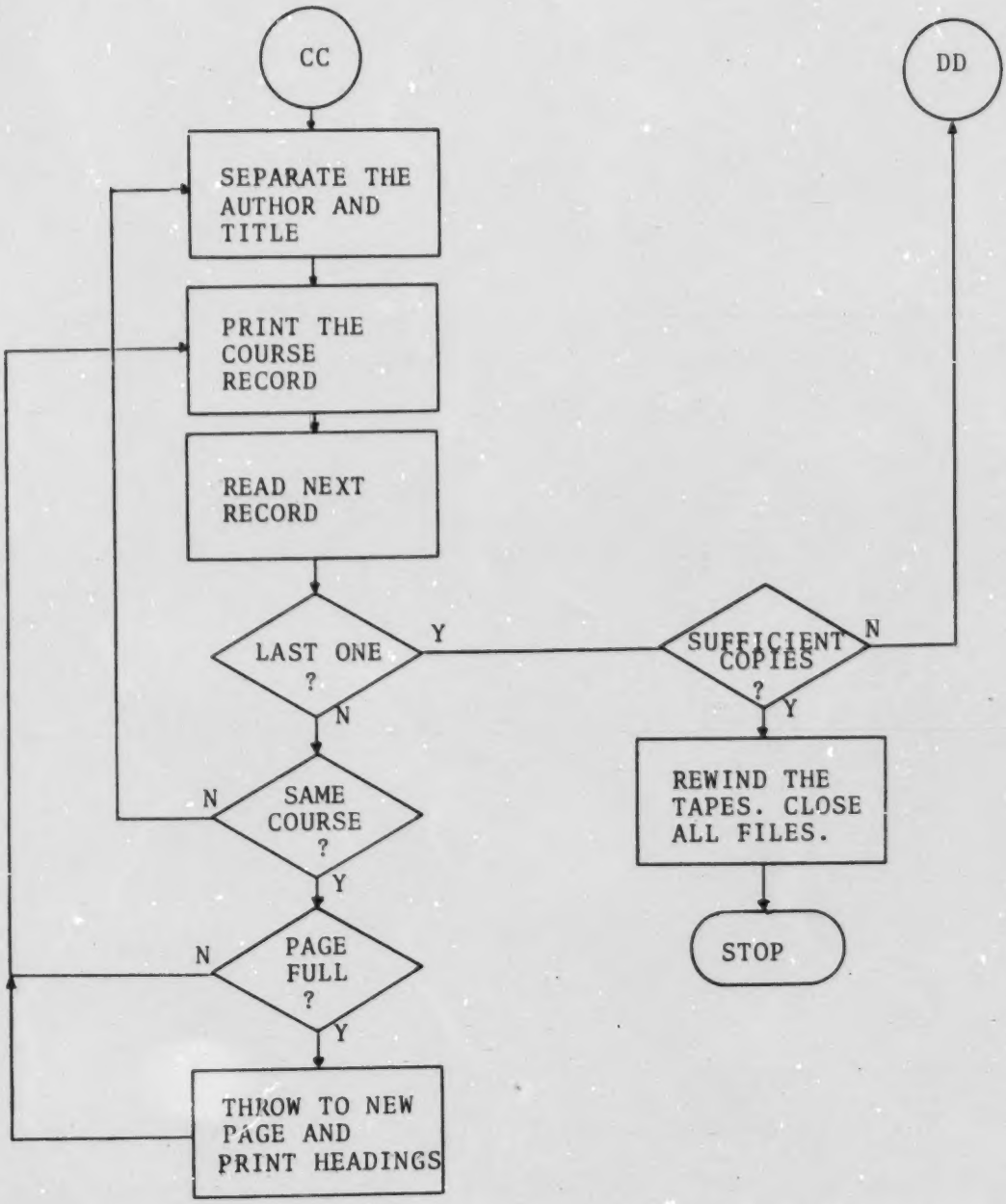
FLOW DIAGRAM OF #SLPB



FLOW DIAGRAM OF #SLPB (continued)



FLOW DIAGRAM OF #SLPB (continued)



5.4.3 #SLPB

This programme is used to provide the main print-outs in author and course-code order.

Three parameter cards are needed with this programme, being:

i) The number of copies of the author-list required.

ii) The expiry code of the current term or vacation.

iii) The number of copies of the course-code list required.

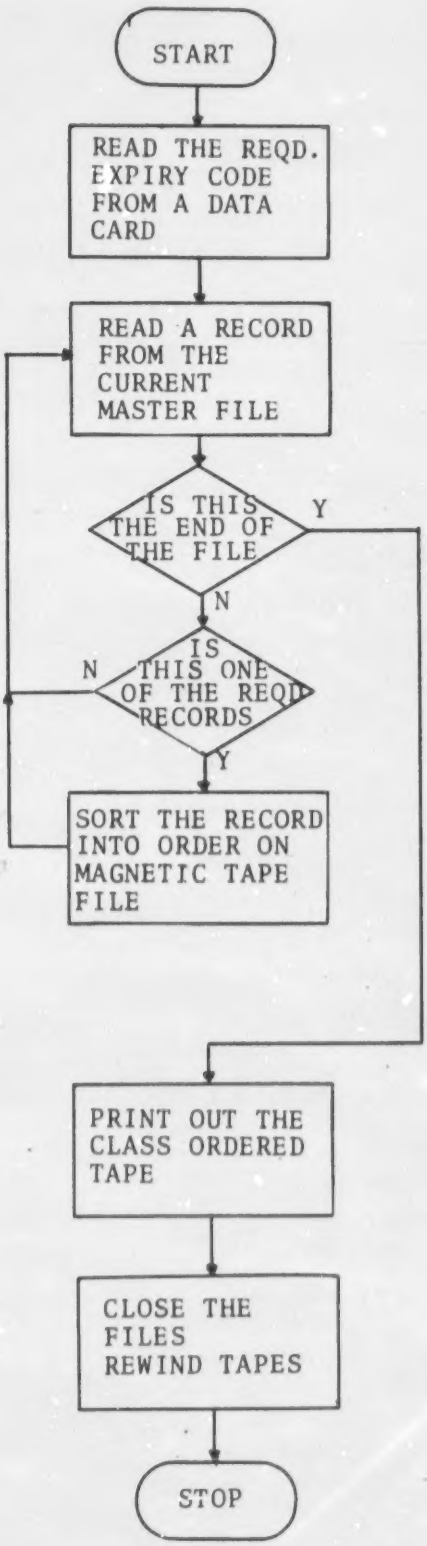
5.4.4 #SLPX

Before removing a batch of records from the files when they have come to the end of their allotted time in the Collection it is first necessary to identify them. Programme #SLPX performs this function. It reads the author sorted magnetic tape file and copies those items due to be extracted from the Collection onto another magnetic tape. This is sorted into classmark order, and into author, title and copy number order within each classmark. The resulting print-out enables the easy detection of 'expired' books on the Collection shelves.

5.4.5 Other programmes

The complete set of programmes for the control of the Collection also includes short programmes which were used in the early days to enable the contents of the various magnetic tape files to be printed out in an unaltered form; this assisted in the elimination of certain fault conditions. We also have variations of the programmes #SLC4, #SLMZ, and #SLPB, from which the current versions developed almost by a process of natural selection. These four programmes enable us to maintain complete control over our system.

FLOW DIAGRAM OF #SLPX


START
READ THE REQD. EXPIRY CODE FROM A DATA CARD
READ A RECORD FROM THE CURRENT MASTER FILE
IS THIS THE END OF THE FILE
Y
N
IS THIS ONE OF THE REQD RECORDS
N
Y
SORT THE RECORD INTO ORDER ON MAGNETIC TAPE FILE
PRINT OUT THE CLASS ORDERED TAPE
CLOSE THE FILES REWIND TAPES
STOP

6 FACTORS AFFECTING COSTS (Time and money)

In this chapter the cost of manually producing a visible index is compared with the cost of producing a list by computer.

6.1 Adding a single book to the Collection

One of the chief advantages of the original manual visible index (the only previous public record of the Collection) was the speed at which a single book could be added; a single book could be processed, and an index slip typed and displayed in a matter of minutes.

With the computer system the corresponding process takes 24 hours. The book itself could often be made available in a few minutes; the delay occurs in adding a new index entry to the print-out.

6.2 Adding many books to the Collection

The time taken to process books is roughly the same under both the old and the new methods, but, because additional information regarding copy number and course code is entered under the new method, the new method probably takes marginally longer.

The filing of multiple visible index strips was an unpopular, time-consuming job. The greater the number of slips the slower was the filing because of a psychological disinclination to file something so difficult to manipulate.

With the new system it is as easy and as quick to file multiple entries as it is to file a single one.

6.3 Time taken to delete records entered incorrectly and to re-insert new ones

Incorrectly typed or filed visible index strips could be torn out in a few seconds; correction of the errors took slightly longer.

Corrections are also simple in the new method, but if a mistake is not caught in earlier checks and appears in the main print-out, it could remain in the print-out for up to 7 days before being removed.

6.4 Time taken to remove 'expired' items from the Collection

Under the old system, every book in the Collection had to be examined and the expiry code checked. Those no longer required were removed from the shelves; they

were then sorted into author order and were used to find and remove their entries from the visible index - a tedious job and (because of multicopies) difficult to do accurately. This was so much the case that books remaining in the Collection were often also checked against the visible index in an effort to eliminate errors.

Under the new system a list of those books to be removed from the Collection is automatically produced; since the books on the shelves are in the same order as the list, it is a simple matter to remove them. The amended list of those books remaining in the Collection is easily produced.

6.5 Typing time taken to prepare each entry on an 80 column card

The typing of an entry for the visible index was very quick, depending on the speed of the typist, since it consisted only of the author's surname, brief title, number of copies and classmark.

A formatted 80 column punched card is produced under the new system. This takes longer to produce than the simple typed strip, since not only is additional information given (author's initials, more complete title, copy number, expiry code and course code) but each field must be punched precisely into the correct area, and a card punching machine is more sophisticated and idiosyncratic than a typewriter.

6.6 Accuracy

Because 'anyone who could type' did so, the visible index was rather untidy and poorly typed, though basically accurate. Checking for accuracy was difficult because of irregular layout.

Spelling mistakes are not easily found even under the new system but practically all other errors are easily spotted. Because card punching errors are more important than typing errors in filing and de-filing and in ordering the print-out (humans can often recognise and interpret an error when the computer cannot) very much more time and care has to be devoted to accuracy.

The daily supplement is carefully checked for errors. Any which are found are corrected before the records are integrated with the main file.

6.7 Preparation of a new entry

Under the old system, the details of the request cards were checked and an expiry code worked out.

Under the new system details of the request cards

must also be checked, but with even greater care. The author/title entry is worked out and this is often more difficult since no more than 58 characters are permitted. A rather more sophisticated expiry code is worked out, a copy number is added and, if they are not provided, course code details must also be sought and entered.

6.8 Ease of use by students and staff

Formerly only one copy of an author listing was provided. The provision of multiple copies (except by Xeroxing) would have been impossible on the grounds of time alone, and experiments with Xerox did not prove very satisfactory.

Now multiple copies are printed, arranged both by author and by course. The usual provision is five copies of an author list and two of a course list, with an additional copy of each for Service Desk use. Display is very legible, columns are neatly separated and adequate spacing is given. Multiple copies are more convenient for readers, who now do not need to queue to consult a single list; students now demand course lists, and teaching staff also find them convenient when checking whether the books they requested have been made available.

7 COSTS

7.1 Old Manual System

The cost of the former scheme may be estimated as follows:

The time taken:

A To put books on Short Loan

a)	to service 7,500 books	84 hours per year
b)	to allocate expiry codes	50 hours per year
c)	to type 7,500 visible index strips	63 hours per year
d)	to file 7,500 visible index strips	63 hours per year
e)	to file 7,500 green cards	36 hours per year
	Total time taken	300 hours approx

At an average salary of £750 p.a., this works out at £110 approx.

B To take books off Short Loan (which includes checking the shelves to identify those books to be removed from the Collection, re-sorting them into author order to enable the visible index to be updated, re-servicing them and recording the number of issues on green Short Loan cards for the information of teachers) took about 90 man days a year, i.e. 630 hours.

At an average salary of £750 p.a., this works out at £230 approx.

The total labour cost of the former scheme was thus £340.

7.2 New Computer-aided System

The cost of the present scheme is estimated as follows:

7.2.1 LABOUR

The time taken:

A To put books on Short Loan

a)	to service 7,500 books (see 3.1.vi)	84 hours per year
b)	to code them	21 hours per year
c)	to punch 7,500 cards	63 hours per year
d)	to file them (because automatically filed)	0 hours per year
*e)	to prepare for print-out	45 hours per year
*f)	to check daily supplements	90 hours per year
g)	to decollate three part stationery	90 hours per year
h)	to file 7,500 green cards	36 hours per year
		429 hours per year

Junior assistants time - 294 hours at £0.37½ per hour	£110 approx
* Senior assistants time - 135 hours at £0.82½ per hour	£111 approx
	£221 approx

B To take books off Short Loan (this includes re-servicing and recording of issues only) takes an estimated 165 hours per year.

£165 hours at £0.37½ per hour £62

TOTAL LABOUR COST £283 per year

Labour cost of former scheme	£340
Labour cost of new scheme	£283
Saving of new scheme	£57

7.2.2 Programming Costs

The basic design of the system and its programming took approximately 9 man weeks (the first three weeks of which were involved with learning to programme in Cobol).

The cost of this phase was:

a) Labour	£350
b) Computer time	£100

These costs are 'once only' costs.

7.3 Machine Running Cost of Computer Aided System

The computer we are using is an ICL 1909 computer with 32k of core storage, 3 disc units and 4 slow magnetic tape units.

a) Daily Supplements

The production of the daily supplements uses on average 20 seconds of machine processing time and costs approximately £1 to produce.

The supplements are produced 5 times each week in term time (10 week terms), and approximately a further 10 times within the three vacations. Thus a total computer cost of £1 x 160 = £160 is caused by the supplements.

b) Weekly Print-outs

The weekly print-outs of six author lists and three course lists take approximately 350 seconds of machine processing time and cost approximately £9 to produce.

This main list is produced once a week in term time and a further 5 times within the 3 vacations giving an annual cost of 35 x £9 = £315.

c) Expired Items Print-out

These print-outs are produced at the end of each of the six major subdivisions in our year, as well as a further 3 occasional times in the year. Each class print-out takes on average 60 seconds of machine time and costs us approximately £2 to produce.

The annual cost of this operation is £2 x 9 = £18.

d) Total Machine Running Cost Per Annum

Supplements List	160
Weekly Print-outs	315
Expired Items Print-out	18
	£493

Since the computer is basically limited by the speed of the line printer the cost figures can be scaled up or down for different collection size and volatility to give approximate estimates of likely cost.

e) Total Cost of the New System

Labour	283
Machine	493
	£776 per year

8 REFLECTIONS ON POSSIBLE VARIATIONS AND EXTENTIONS

8.1 Assuming no other interacting system

There are many alterations that could be made to the basic programmes to make the actual updating and printing procedures simpler. A deliberate decision was taken when the system was first devised to fragment the control programmes in order that one clearly identified and controlled programme could be called upon to perform a particular operation. It was felt that since the persons actually using the programmes on a day-to-day basis would not be very familiar with computers the simpler their choice could be made the better. Since we tend, when updating the files, to require a print-out immediately afterwards, the programmes have to be connected together in a meaningful way. This caused both delays and frustration when the system first went 'live'.

We were fortunate at Lancaster in having available some system software by means of which the basic Lancaster University Computer Operating System could be enhanced to allow it to accept a very complicated job. By selecting a particular sequence of job cards the required inter-connection of the various programme 'building bricks' is simply and quickly achieved. Other organizations not having an operating system capable of dealing with a very complicated job description would be well advised to incorporate within one programme all the difficult conditions and requirements likely to be met with when controlling the Collection. For example, the one programme should produce a supplements list, amend the main file, print out the author-ordered and any other ordered lists required.

The extension of the Reserve Collection listing to include a title-ordered listing is not quite as simple as is the production of an author, class or course ordered listing, since now the articles in the nominative case in all languages must not have any filing value, nor should they be allowed to spoil the legibility and ease of use of the list. A possible way round this problem is to examine each title. If 'the' or 'a' is found in the leading position of a title the appropriate flag is set in a special field associated with each record. The title is then amended to exclude 'the' or 'a' and is left shifted where necessary. The records are now sorted in the usual way. When printing out the title 'the' or 'a' can be inserted, where appropriate, by reference to the contents of the special field. As many different Western languages as are required could be accomodated in this way.

Another extension to the system, which would eliminate the necessity to retain the original request cards for later return to the requester, would be to print out a list of books belonging to each course (or lecturer) as they are removed from the Collection, with a suitable space left blank to allow the insertion of the number of times the item had been used each term.

The sort programme could be expanded to allow for the correct in-filing of 'Mac', and 'Saint', or other author and title prefixes.

8.2 Assuming the presence of an automated issue system and a machine readable catalogue

It should be possible to integrate the control of the Short Loan Collection into an overall issue control system in a very convenient manner. For example, as far as the circulation control system is concerned the Collection is just another borrower. Books would be issued to the Collection similarly to the way in which they are issued to an ordinary borrower. The only extra facility required would be a means of ascribing a course code and an expiry code to each Collection item. This could be done by means of an extra card read immediately after the book card for a particular Collection entry, or by typing the information in via a keyboard.

A list of the books currently in the Collection could be obtained in a similar manner to that used to discover how many books were currently held by an individual borrower. The only conditions to apply would be that in the case of certain special borrowers, such as the bindery, the Reserve Collection, inter-library loans, etc., the print-out of lists of items could be displayed in a slightly different manner to the usual listing with different main headings accompanying the print-out.

The recall of books already out on loan, but now required for the Reserve Collection could also be done in a semi-automatic manner by scanning the issue file and, in the case of multicopies being out on loan simultaneously, either making a pre-programmed value judgement of which copy or copies to recall, based on length of time borrowed or status of borrower, or just outputting all items for a manual decision to be made by a member of the service desk staff.

Reporting of usage of individual titles in each course could be handled automatically given an automated issue.

Reporting of the need for extra copies could also be handled automatically by an automated issue system based

on computations relating recorded use and number of copies. This specific point was analysed in Occasional Paper 2.

9 CONCLUSION

The Short Loan listing and control system described above has been working satisfactorily in the University of Lancaster Library for the past year.

The undergraduates who borrow books from this Collection, as well as the staff who request books to be added to it, prefer the new system to the old one. The acceptance of the new lists by our borrowers was immediate and no criticisms of reduction in service have been levelled at us.

The library staff who operate the system took a little longer to adjust to the computer's often infuriating demands for accuracy. The worries and suspicions of the staff (for invariably such occur when computer systems are introduced) have been allayed. They are reassured that the main aim of introducing computer systems in libraries is to offer a better, more extensive service to borrowers at a realistic cost, rather than to make any of them redundant.

1. SHAW, C.M. Duplicate provision for undergraduates. Journal of Librarianship, 3 (3) July 1971, 190 - 206.

2. BUCKLAND, M.K. & WOODBURN, I. An analytical approach to duplication and availability. (University of Lancaster Library Occasional Paper, 2). 1968.

Revised versions have appeared in:

a) Information Storage and Retrieval, 5, 1969, 69 - 79.
b) SARACEVIC, T., ed. Introduction to Information Science. N.Y., Bowker, 1971, pp. 193 - 199.

3. BUCKLAND, M.K. & HINDLE, A. Loan policies, duplication and availability. In: MACKENZIE, A.G. & STUART, I.M., eds. Planning library services. (University of Lancaster Library Occasional Paper, 3.) 1969.

4. BUCKLAND, M.K. and others. Systems analysis of a university library. (University of Lancaster Library Occasional Paper, 4.) 1970. Chapter 6.

A less technical version entitled: "An O.R. case study of a variable loan and duplication policy at the University of Lancaster Library" appears in The Library Quarterly, 42, (1), January 1972, 97 - 106.

5. FASANA, P.J. and others. A computer based system for reserve activities in a university. Final Report Columbia University, New York, 1969.

6. ODDY, R.N. Computer Processing of Library Files at Durham University. University of Durham, 1971.

7. CARMACK, R. & LOEBER, T. The Library Reserve System - another look. Coll. & Res. Lib., 32, (2), March 1971, 105 - 109.

8. PEACOCK, P.G. The Short Loan Collection in a University Library. Journal of Librarianship 4(2), April 1972, 130-136.

Appendix A

Listing of #SLC4

```
   1900 COBOL COMPILER #XE20 PK. 4      COBOL SOURCE FILE   DATE 20/06/71   TIME 23/32/50

COMPILER SEQUENCING
000100 IDENTIFICATION DIVISION.
000200 PROGRAM-ID. SLC450.
000300 ENVIRONMENT DIVISION.
000400 CONFIGURATION SECTION.
000500 SOURCE-COMPUTER ICT-1905.
000600 OBJECT-COMPUTER ICT-1905, MEMORY 10000 WORDS.
000700 SPECIAL-NAMES.
000800      *DATE IS RUN-DATE.
000900      BIT-00 ON STATUS IS COURSE-SORT.
001000 INPUT-OUTPUT SECTION.
001100 FILE-CONTROL.
001200      SELECT IN-CARD ASSIGN TO CARD-READER 1 RESERVE 1.
001300      SELECT  IN-TAPE ASSIGN TO 1 TAPES RESERVE 1.
001400      SELECT COURSE-TAPE ASSIGN TO 1 TAPES.
001500      SELECT OUT-PRINT ASSIGN TO PRINTER 1.
001600 DATA DIVISION.
001700 FILE SECTION.
001800 FD  IN-CARD
001900      BLOCK CONTAINS 80 CHARACTERS
002000      LABEL RECORDS OMITTED
002100      DATA RECORD IS DATA-CARD.
002200 01  DATA-CARD.
002300   02 AUTI      PIC X(58).
002400   02 CONJ PIC 99.
002500   02 CLNA PIC X(11).
002600   02 EXCO PIC X.
002700   02 COND   PIC X(7).
002800   02 FILLER PIC X.
002900 FD  IN-TAPE  BLOCK CONTAINS 2048 CHARACTERS
003000              LABEL RECORDS STANDARD
003100              VALUE OF ID IS "SLAUTHORAMND"
003200              DATA RECORD IS IN-RECORD.
003300 01   IN-RECORD.
003400   02 WORD-COUNT PIC 1(24).
003500   02 AUTHOR-REC.
003600   03 AUTI-1          PIC X(58).
003700   03 CONJ-1          PIC 99.
003800   03 CLNA-1          PIC X(11).
003900   03 EXCO-1          PIC X.
004000   03 COND-1          PIC X(7).
004100   03 FILLER          PIC X.
004200 FD  COURSE-TAPE
004300                  BLOCK CONTAINS 2048 CHARACTERS
004400      LABEL RECORDS STANDARD
004500      VALUE OF ID IS "SLCOURSEAMND"
004600      DATA RECORD  IS  TAPE-IN-1.
004700 01  TAPE-IN-1.
004800   02 WORD-COUNT PIC 1(24).
004900   02  COURSE-REC.
005000    03 C-REC           PIC X(7).
005100    03 REST-REC        PIC X(73).
005200 FD OUT-PRINT
005300      LABEL RECORDS OMITTED
005400      DATA RECORD IS PRINTLINE.
005500 01  PRINTLINE.
```

Cont.

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005600     02 FILLER          PIC X(10).
005700     02 C-PART          PIC X(7).
005800     02 FILLER          PIC X(10).
005900     02 REST-PART       PIC X(73).
006000     02 FILLER          PIC X(20).
006100 WORKING-STORAGE SECTION.
006200 01  CSAW-LENGTH PIC 1(24) VALUE 21.
006300 01  CSAW-KEY.
006400     02 KEY-LENG     PIC 1(9)  VALUE 47.
006500     02 KEY-WORD     PIC 1(15) VALUE 1.
006600 01  CSAW-KEY-1.
006700     02 KEY-LE-1     PIC 1(9  VALUE 40.
006800     02 KEY-WO-1 PIC 1(15) VALUE 1.
006900 01  CSAW-NAME PIC X(12) VALUE "SLCOURSEAMND".
007000 01  CSAW-NA-1 PIC X(12) VALUE "SLAUTHORAMND".
007100 01  CSAW-GEN-NO PIC 1(24) VALUE 0.
007200 01  CSAW-REF-PD PIC 1(24) VALUE 990.
007300 01  CSAW-RECORD.
007400     02 WC        PIC 1(24) VALUE 21.
007500   02 CSAW-R1.
007600     03 R1-CONO       PIC X(7).
007700     03 R1-AUTI       PIC X(59).
007800     03 R1-CONU       PIC 99.
007900     03 R1-CLHA       PIC X(11).
008000     03 R1-EXCO       PIC X.
008100     03 R1-FILLER     PIC X.
008200 01  TWENTYONE  PIC 1(24) VALUE 21.
008300 01  N             PIC 9999 COMP SYNC RIGHT VALUE 0.
008400 01  HEADLINE-1  PIC X(120) VALUE "
008500-    "SUPPLEMENTARY LIST OF RECENT ADDITIONS. THE MAIN LIST FOLLOW
008600-    "S.                                                          "
008700 01  HEADLINE-2  PIC X(120) VALUE "
008800-    "------------------------------------------------------------
008900-    "-                                                           "
009000 01  LINE-COUNT  PIC 9(4) COMP SYNC RIGHT VALUE 0.
009100 PROCEDURE DIVISION.
009200 START-UP.
009300     OPEN INPUT IN-CARD.
009400     IF COURSE-SORT GO TO COURSE-ROUTINE.
009500 READ-A-CARD.
009600     READ IN-CARD AT END GO TO LAST-CARD.
009700     MOVE  DATA-CARD TO CSAW-R1.
009800 CSAW-CALL.
009900     ENTER PLAN CSAW USING CSAW-LENGTH, CSAW-KEY-1, CSAW-RECORD,
010000     CSAW-NA-1, CSAW-GEN-NO, CSAW-REF-PD.
010100 CSAW-EXIT.
010200     GO TO READ-A-CARD.
010300 LAST-CARD.
010400     MOVE ZERO TO CSAW-LENGTH.
010500     PERFORM CSAW-CALL.
010600 COURSE-ROUTINE.
010700     OPEN INPUT  IN-TAPE.
010800     MOVE TWENTYONE TO CSAW-LENGTH.
010900 READ-A-RECORD.
011000     READ IN-TAPE AT END GO TO LAST-RECORD.
011100     MOVE AUTI-1   TO  R1-AUTI.
011200     MOVE  CONU-1   TO  R1-CONU.
011300     MOVE  CLHA-1   TO  R1-CLHA.
011400     MOVE  EXCO-1   TO R1-EXCO.
```

Cont.

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011500      MOVE  COND-1   TO  R1-COND.
011600 CSAW-ENTER.
011700      ENTER PLAN CSAW USING CSAW-LENGTH, CSAW-KEY, CSAW-RECORD,
011800      CSAW-NAME, CSAW-GEN-NO, CSAW-RET-PD.
011900 CSAW-END.
012000      GO TO READ-A-RECORD.
012100 LAST-RECORD.
012200      CLOSE IN-TAPE.
012300      MOVE ZERO TO CSAW-LENGTH.
012400      PERFORM CSAW-ENTER.
012500      OPEN OUTPUT OUT-PRINT.
012600 XX.
012700      OPEN INPUT IN-TAPE  COURSE-TAPE.
012800      ADD 1 TO N.
012900      MOVE ZERO TO  LINE-COUNT.
013000      MOVE SPACES TO PRINTLINE.
013100      WRITE  PRINTLINE  AFTER  CHANNEL=3.
013200      MOVE HEADLINE-1 TO PRINTLINE.
013300      WRITE PRINTLINE AFTER CHANNEL=2.
013400      MOVE HEADLINE-2 TO PRINTLINE.
013500      WRITE PRINTLINE AFTER ADVANCING 1 LINES.
013600 READ-WRITE-LOOP.
013700      ADD 1 TO LINE-COUNT.
013800      READ IN-TAPE AT END GO TO COURSE-JOB.
013900      MOVE  AUTHOR-REC TO PRINTLINE.
014000      IF LINE-COUNT  =  45  GO TO XYZ.
014100      WRITE PRINTLINE AFTER ADVANCING 1 LINES.
014200      GO TO READ-WRITE-LOOP.
014300 COURSE-JOB.
014400      CLOSE IN-TAPE.
014500      MOVE ZERO TO  LINE-COUNT.
014600      MOVE SPACES TO PRINTLINE.
014700      WRITE  PRINTLINE  AFTER  CHANNEL=3.
014800      MOVE HEADLINE-1 TO PRINTLINE.
014900      WRITE PRINTLINE AFTER CHANNEL=2.
015000      MOVE HEADLINE-2 TO PRINTLINE.
015100      WRITE PRINTLINE AFTER ADVANCING 1 LINES.
015200 R-W-LOOP.
015300      READ COURSE-TAPE  AT END GO TO WRAP-UP.
015400      ADD 1 TO LINE-COUNT.
015500      MOVE C-REC TO C-PART.
015600      MOVE REST-REC TO REST-PART.
015700      IF LINE-COUNT  =  45  GO TO XYZ-C.
015800      WRITE PRINTLINE AFTER ADVANCING 1 LINES.
015900      GO TO R-W-LOOP.
016000 XYZ.
016100      WRITE PRINTLINE AFTER CHANNEL=2.
016200      MOVE ZERO TO  LINE-COUNT.
016300      GO TO READ-WRITE-LOOP.
016400 XYZ-C.
016500      WRITE PRINTLINE AFTER CHANNEL=2.
016600      MOVE ZERO TO  LINE-COUNT.
016700      GO TO R-W-LOOP.
016800 WRAP-UP.
016900      CLOSE COURSE-TAPE.
017000      IF N < 6 GO TO XX.
017100      STOP "END OF JOB".
****
                                                MAP FD IN-CARD
```

Appendix B

Listing of #SLMZ

```
000100 IDENTIFICATION DIVISION.
000200 PROGRAM-ID  SLM250.
000300 ENVIRONMENT DIVISION.
000400 CONFIGURATION SECTION.
000500 SOURCE-COMPUTER  ICT-1905.
000600 OBJECT-COMPUTER  ICT-1905, MEMORY 10000 WORDS.
000700 SPECIAL-NAMES.
000800     BIT-01 ON STATUS IS EXPDELETE.
000900     BIT-02 ON STATUS IS CARD-DELETE.
001000     BIT-03 ON STATUS IS  AMEND-RUN.
001100 INPUT-OUTPUT SECTION.
001200 FILE-CONTROL.
001300     SELECT IN-TAPE ASSIGN TO 1 TAPES.
001400     SELECT OUT-TAPE ASSIGN TO 1 TAPES.
001500     SELECT AMEND-TAPE ASSIGN TO 1 TAPES.
001600     SELECT IN-CARD ASSIGN TO CARD-READER 1.
001700     SELECT OUT-PRINT ASSIGN TO 1 PRINTER.
001800 DATA DIVISION.
001900 FILE SECTION.
002000 FD  IN-CARD
002100     BLOCK  CONTAINS 80 CHARACTERS
002200     LABEL RECORDS OMITTED
002300     DATA RECORD IS DATA-CARD.
002400 01  DATA-CARD.
002500   02 AUTI.
002600     03 EX-CO              PIC X.
002700     03 FILLER             PIC X(57).
002800   02 CONU                 PIC 99.
002900   02 CLMA                 PIC X(11).
003000   02 EXCO                 PIC X.
003100   02 CONO                 PIC X(7).
003200   02 FILLER               PIC X.
003300 FD  AMEND-TAPE
003400     BLOCK CONTAINS 2048 CHARACTERS
003500     LABEL RECORDS STANDARD
003600     VALUE OF ID IS "SLAUTHORAMND"
003700     DATA RECORD IS AMEND-RECORD.
003800 01  AMEND-RECORD.
003900   02 WC                   PIC 1(24).
004000   02 COMPA-PART-A         PIC X(40).
004100   02 FILLER               PIC X(20).
004200 FD  IN-TAPE
004300     BLOCK CONTAINS 2048 CHARACTERS
004400     LABEL RECORDS STANDARD
004500     VALUE OF ID IS  "SLAUTHORSORT"
004600     DATA RECORD IS IN-RECORD.
004700 01  IN-RECORD.
004800   02 WC                   PIC 1(24).
004900   02 RECORD-IN.
005000     03 COMPA-PART.
005100       04  AUTI-A          PIC X(58).
005200       04  CONU-A          PIC 99.
005300     03 CLMA-A             PIC X(11).
005400     03 EXCO-A             PIC X.
005500     03 CONO-A             PIC X(7).
005600     03 FILLER             PIC X.
005700 FD  OUT-TAPE
005800     BLOCK CONTAINS  2048 CHARACTERS
005900     LABEL RECORDS STANDARD
006000     VALUE OF ID IS "SLAUTHORSORT"
006100     ACTIVE-TIME IS  900
006200     DATA RECORD IS OUT-RECORD.
006300 01  OUT-RECORD.
006400   02 WC                   PIC 1(24).
006500   02 FILLER               PIC X(80).
006600 FD  OUT-PRINT
```

Cont.

```
006700      LABEL RECORDS ARE OMITTED
006800      DATA RECORDS ARE PRINT-LINE, ERROR-LINE.
006900 01   PRINT-LINE.
007000      02 FILLER          PIC X(10).
007100      02 ERROR-MESS      PIC X(80).
007200      02 FILLER          PIC X(30).
007300 01   ERROR-LINE.
007400      02 MESSAGE-1       PIC X(30).
007500      02 FILLER          PIC X(81).
007600 WORKING-STORAGE SECTION.
007700 01   EXECODE            PIC X.
007800 01   ARROW              PIC X  VALUE "+".
007900 01   N                  PIC X  VALUE "+".
008000 01   MARKER-1           PIC X  VALUE "+".
008100 01   MARKER-2           PIC X  VALUE "+".
008200 01   CSAV-LENGTH        PIC 1(24) VALUE 21.
008300 01   CSAV-KEY.
008400      02 KEY-LENG        PIC 1(8)  VALUE 60.
008500      02 KEY-WORD        PIC 1(16) VALUE 1.
008600 01   CSAV-NAME          PIC X(12) VALUE "SLAUTHORAMNO".
008700 01   CSAV-GEN-NO        PIC 1(24) VALUE 0.
008800 01   CSAV-RET-PD        PIC 1(24) VALUE 000.
008900 01   CSAV-RECORD.
009000      02 WC              PIC 1(24) VALUE 21.
009100      02 CSAV-R1         PIC X(30).
009200 01   ERROR-MESSAGE PIC X(41) VALUE "ERROR.  CARD  OUT  OF  ORDER .
009300-     "   IGNORED.".
009400 PROCEDURE DIVISION.
009500 START-UP.
009600      OPEN INPUT IN-TAPE  OUTPUT OUT-TAPE, OUT-PRINT.
009700      MOVE ALL SPACES TO PRINT-LINE.
009800      WRITE PRINT-LINE AFTER CHANNEL-1.
009900      IF AMEND-RUN GO TO START-SORT.
010000 GO-1.
010100      IF AMEND-RUN OPEN INPUT AMEND-TAPE.
010200      READ IN-TAPE AT END GO TO FIN-1.
010300 R-U-LOOP.
010400      IF EXPDELETE OPEN INPUT IN-CARD.
010500      IF EXPDELETE READ IN-CARD AT END GO TO  FIN-4.
010600      IF EXPDELETE GO TO DELETE-ROUTE.
010700      IF CARD-DELETE  OPEN INPUT IN-CARD.
010800      IF CARD-DELETE  READ IN-CARD AT END GO TO FIN-3.
010900      IF AMEND-RUN READ AMEND-TAPE AT END GO TO FIN-5.
011000      IF AMEND-RUN MOVE ARROW TO N.
011100 LOOP-1.
011200      IF FX-CO = "+" GO TO JUMP-1.
011300      IF DATA-CARD = RECORD-IN GO TO YY.
011400      IF DATA-CARD < RECORD-IN GO TO CARD-OUT-OF-ORDER-1.
011500 JUMP-1.
011600      IF AMEND-RUN GO TO ABC.
011700      GO TO CRA.
011800 CARD-OUT-OF-ORDER-1.
011900      MOVE ERROR-MESSAGE TO MESSAGE-1.
012000      WRITE ERROR-LINE AFTER ADVANCING 2 LINES.
012100      MOVE ALL SPACES TO PRINT-LINE.
012200      MOVE DATA-CARD TO ERROR-MESS.
012300      WRITE PRINT-LINE AFTER ADVANCING 1 LINES.
012400      MOVE ALL SPACES TO ERROR-LINE.
012500 PERFORM-BREAK.
012600      READ IN-CARD AT END GO TO FIN-2.
012700      GO TO LOOP-1.
012800 ABC.
012900      IF COMPA-PART > COMPA-PART-A GO TO NEXT-AMEND.
013000 CRA.
013100      MOVE IN-RECORD TO OUT-RECORD.
013200      WRITE OUT-RECORD
```

Cont.

```
013300      READ IN-TAPE AT END GO TO TRANSFER-1.
013400      GO TO LOOP-1.
013500 NEXT-AMEND.
013600      MOVE AMEND-RECORD TO OUT-RECORD.
013700      WRITE OUT-RECORD.
013800      READ AMEND-TAPE AT END GO TO TRANSFER-2.
013900      GO TO LOOP-1.
014000 TRANSFER-1.
014100      IF N = "F" GO TO FIN.
014200      MOVE AMEND-RECORD TO OUT-RECORD.
014300      WRITE OUT-RECORD.
014400      READ AMEND-TAPE AT END GO TO FIN.
014500      GO TO TRANSFER-1.
014600 TRANSFER-2.
014700      MOVE IN-RECORD TO OUT-RECORD.
014800      WRITE OUT-RECORD.
014900      READ IN-TAPE AT END GO TO FIN.
015000      GO TO TRANSFER-2.
015100 DELETE-ROUTE.
015200      IF CARD-DELETE GO TO DL-1.
015300      IF EXCO-A = EX-CO GO TO AA.
015400      MOVE IN-RECORD TO OUT-RECORD.
015500      WRITE OUT-RECORD.
015600 AA.
015700      READ IN-TAPE AT END GO TO FIN.
015800      GO TO DELETE-ROUTE.
015900 DL-1.
016000      MOVE EX-CO TO EXPCODE.
016100 DL-2.
016200      IF MARKER-1 = "*" READ IN-CARD AT END GO TO FIN-2.
016300 DL-3.
016400      IF EX-CO = "*" GO TO JUMP-2.
016500      IF DATA-CARD = RECORD-IN GO TO BB.
016600      IF DATA-CARD < RECORD-IN GO TO CARD-OUT-OF-ORDER-2.
016700 JUMP-2.
016800      IF EXCO-A    = EXPCODE GO TO BB-1.
016900      MOVE IN-RECORD TO OUT-RECORD.
017000      WRITE OUT-RECORD.
017100 BB-1.
017200      READ IN-TAPE AT END GO TO FIN.
017300      GO TO DL-3.
017400 CARD-OUT-OF-ORDER-2.
017500      PERFORM CARD-OUT-OF-ORDER-1.
017600      READ IN-CARD AT END GO TO FIN-2.
017700      GO TO DL-3.
017800 BB.
017900      READ IN-TAPE AT END GO TO FIN.
018000      GO TO DL-2.
018100 YY.
018200      IF CARD-DELETE READ IN-CARD AT END GO TO FIN-2.
018300      READ IN-TAPE AT END GO TO FIN-1.
018400      GO TO LOOP-1.
018500 FIN-2.
018600      MOVE ARROW TO MARKER-1.
018700      IF EXPDELETE GO TO DL-2.
018800      GO TO LOOP-1.
018900 START-SORT.
019000      OPEN INPUT IN-CARD.
019100 READ-A-CARD.
019200      READ IN-CARD AT END GO TO LAST-CARD.
019300      MOVE DATA-CARD TO CSAU-01.
019400 CSAU-CALL.
019500      ENTER PLAN CSAU USING CSAU-LENGTH, CSAU-KEY,   CSAU-RECORD,
019600      CSAU-NAME, CSAU-GEN-NO, CSAU-RET-PD.
019700 CSAU-EXIT.
019800      GO TO READ-A-CARD.
```

Cont.

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019500 LAST-CARD.
020000     MOVE ZERO TO CSAV-LENGTH.
020100     PERFORM CSAV-CALL.
020200     CLOSE IN-CARD.
020300     GO TO GO-1.
020400 FIN-1.
020500     STOP "IN-TAPE READ ERROR".
020600 FIN-4.
020700     STOP "NO EXPDELETE CARD".
020800 FIN-3.
020900     STOP "NO DATA CARDS".
021000 FIN-5.
021100     STOP "AMEND-TAPE READ ERROR".
021200 FIN.
021300     IF CARD-DELETE OR EXPDELETE  CLOSE IN-CARD.
021400     CLOSE IN-TAPE WITH LOCK.
021500     CLOSE OUT-TAPE.
021600     CLOSE OUT-PRINT.
021700     IF AMEND-RUN CLOSE AMEND-TAPE.
021800     STOP RUN.
****
```

Appendix C

Listing of #SLPB

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1900 COBOL COMPILER #XF30 MK. 4      COBOL SOURCE FILE   DATE 13/09/71   TIME 15/59/29

COMPILER SEQUENCING
000100 IDENTIFICATION DIVISION.
000200 PROGRAM-ID. SLPB30.
000300 ENVIRONMENT DIVISION.
000400 CONFIGURATION SECTION.
000500 SOURCE-COMPUTER ICT-1905.
000600 OBJECT-COMPUTER ICT-1905, MEMORY 10000 WORDS.
000700 SPECIAL-NAMES.
000800      *DATE IS RUN-DATE.
000900      BIT-00 ON STATUS IS SELECT-PRINT.
001000      BIT-01 ON STATUS IS COURSE-PRINT.
001100 INPUT-OUTPUT SECTION.
001200 FILE-CONTROL.
001300      SELECT IN-CARD ASSIGN TO CARD-READER 1.
001400      SELECT IN-TAPE ASSIGN TO 1 TAPES.
001500      SELECT  COURSE-TAPE  ASSIGN TO 1 TAPES.
001600      SELECT OUT-PRINT ASSIGN TO 1 PRINTER.
001700      SELECT INFO-IN  ASSIGN TO 1 TAPES.
001800 DATA DIVISION.
001900 FILE SECTION.
002000 FD  IN-CARD
002100      BLOCK CONTAINS 80 CHARACTERS
002200      LABEL RECORDS OMITTED
002300      DATA RECORD IS DATA-CARD.
002400 01  DATA-CARD.
002500   02 CHAR-A.
002600   03 CHAR-0        PIC X.
002700   03 CHAR-1        PIC X.
002800    03 FILLER       PIC XX.
002900   02 CHAR-B    REDEFINES  CHAR-A.
003000    03 CHAR-C       PIC 9(4).
003100   02 FILLER        PIC X(75).
003200   02 LAST-CH       PIC X.
003300 FD  COURSE-TAPE
003400                     BLOCK CONTAINS 2048 CHARACTERS
003500                     LABEL RECORDS STANDARD
003600                     VALUE OF ID IS "SLCOURSESORT"
003700                     DATA RECORD IS OUT-RECORD.
003800 01  OUT-RECORD.
003900   02 WC                  PIC 1(24).
004000   02 COND-C.
004100    03 CO-1               PIC X(4).
004200    03 CO-2               PIC X(3).
004300   02 AUTH-C              PIC X OCCURS 58 TIMES.
004400   02 CONU-C              PIC 99.
004500   02 CLMA-C              PIC X(11).
004600   02 EXCO-C              PIC X.
004700   02 FILLER              PIC X.
004800 FD  INFO-IN           BLOCK CONTAINS 2048 CHARACTERS
004900                       LABEL RECORDS STANDARD
005000                       VALUE OF ID IS "SLREJECTINFO"
005100                       DATA RECORD IS  IN-INFO.
005200 01  IN-INFO.
005300   02 WC                  PIC 1(24).
005400   02 INFO-A.
005500    03 INFO               PIC X    OCCURS 7 TIMES.
005600 FD  IN-TAPE
005700                       BLOCK CONTAINS 2048 CHARACTERS
005800                       LABEL RECORDS STANDARD
005900                  VALUE OF ID IS "SLAUTHORSORT"
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Cont.

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006000              DATA RECORDS ARE IN-RECORD, STAT-RECORD-1.
006100 01  IN-RECORD.
006200  02 WORD-COUNT PIC 1(24).
006300  02 AUTI.
006400   03 AUTI-1 PIC X.
006500  03 FILLER PIC X(57).
006600  02 CONU PIC 99.
006700  02 CLMA PIC X(11).
006800  02 EXCO PIC X.
006900  02 CONO    PIC X(7).
007000  02 FILLER  PIC X.
007100 01  STAT-RECORD-1.
007200  02 WORD-COUNT PIC 1(24).
007300  02 STAT-CHAR   PIC X(4).
007400  02 USE-DATE PIC 1(24).
007500  02 BOOK-TOT PIC 9(4).
007600  02 ADDIT-TOT PIC 9(4).
007700  02 DELET-TOT PIC 9(4).
007800  02 GEN-NUMB PIC 9999.
007900 02 FILLER PIC X(56).
008000 FD  OUT-PRINT
008100     LABEL RECORDS ARE OMITTED
008200                DATA RECORDS ARE PRINTLINE, HEADLINE-1A,
008300                HEADLINE-2A,
008400                          OUTHEAD, SPEC-LINE, HEADLINE-3A,
008500          HEADLINE-4A,
008600                 HEADING, DATE-LINE, DEPT-LINE, COURSE-LINE,
008700                UNDER-LINE, PRINT-NORM, PRINT-SPEC.
008800 01  OUTHEAD   PIC X(120).
008900 01  HEADLINE-1A.
009000  02 FILLER     PIC X(58).
009100  02 H-1-1      PIC X(8).
009200  02 FILLER     PIC X(58).
009300 01  HEADLINE-2A.
009400  02 FILLER     PIC X(9).
009500  02 H-2-1      PIC X(56).
009600  02 FILLER     PIC X(19).
009700  02 H-2-3      PIC X(8).
009800  02 FILLER     PIC X(18).
009900  02 H-2-8      PIC X(5).
010000  02 FILLER     PIC X.
010100  02 H-2-9      PIC X.
010200  02 H-2-10     PIC XX.
010300  02 FILLER     PIC X(9).
010400 01  PRINTLINE.
010500  02 ARR-1      PIC X.
010600  02 FILLER     PIC X(3).
010700  02 AUTI-2.
010800  03 AU-FIELD PIC X OCCURS 25 TIMES.
010900   03 FILLER  PIC X(4).
011000   03 TI-FIELD  PIC X OCCURS 40 TIMES.
011100  02 FILLER    PIC XX.
011200  02 CONU-1    PIC 99.
011300  02 FILLER    PIC X(6).
011400  02 CLMA-1   PIC X(11).
011500  02 FILLER    PIC X(6).
011600  02 CONO-1    PIC X(7).
011700  02 FILLER    PIC X(4).
011800 01  HEADLINE-3A.
011900  02 FILLER    PIC X(4).
012000  02 H3-AUTHOR    PIC X(12).
012100  02 FILLER    PIC X(75).
012200  02 H3-TITLE      PIC X(10).
012300  02 FILLER    PIC X(32).
012400  02 H3-CONU   PIC X(4).
012500  02 FILLER    PIC X(5).
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Cont.

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012600   02 H3-CLMA  PIC X(9).
012700   02 FILLER   PIC X(4).
012800   02 H3-CONO PIC X(11).
012900   02 FILLER  PIC XX.
013000 01  SPEC-LINE.
013100   02 ARR-1-S PIC X.
013200   02 FILLER  PIC X(3).
013300   02 AT1-SPEC PIC X OCCURS 78 TIMES.
013400   02 FILLER   PIC XX.
013500   02 CONU-SPE PIC Z9.
013600   02 FILLER   PIC X(4).
013700   02 CLMA-SPE PIC X(11).
013800   02 FILLER   PIC X(6).
013900   02 CONO-SPE PIC X(7).
014000   02 FILLER   PIC X(4).
014100 01  HEADLINE-4A.
014200   02 FILLER  PIC X(42).
014300   02 H-4-1   PIC X(36).
014400   02 FILLER  PIC X(42).
014500 01  PRINT-NORM.
014600   02 FILLER           PIC X(4).
014700   02 AUTHOR-1         PIC X  OCCURS 25 TIMES.
014800   02 FILLER           PIC X(4).
014900   02 TITLE-1          PIC X  OCCURS 49 TIMES.
015000   02 FILLER           PIC X(2).
015100   02 CONU-1-C         PIC Z9.
015200   02 FILLER           PIC X(6).
015300   02 CLMA-1-C         PIC X(11).
015400   02 FILLER           PIC X(10).
015500   02 EXCO-1-C         PIC X.
015600   02 FILLER           PIC X(6).
015700 01  PRINT-SPEC.
015800   02 FILLER           PIC X(4).
015900   02 AUTI-2-S         PIC X  OCCURS  78 TIMES.
016000   02 FILLER           PIC X(2).
016100   02 CONU-2           PIC Z9.
016200   02 FILLER           PIC X(6).
016300   02 CLMA-2           PIC X(11).
016400   02 FILLER           PIC X(10).
016500   02 EXCO-2           PIC X.
016600   02 FILLER           PIC X(6).
016700 01  HEADING           PIC X(120).
016800 01  DATE-LINE.
016900   02 FILLER           PIC X(96).
017000   02 DL-1             PIC  X(8).
017100   02 FILLER           PIC X(96).
017200 01  DEPT-LINE.
017300   02 FILLER           PIC X(10).
017400   02 DEPT-1           PIC X(65).
017500   02 FILLER           PIC X(45).
017600 01  COURSE-LINE.
017700   02 FILLER           PIC X(10).
017800   02 COURSE-1         PIC X(3).
017900   02 FILLER           PIC X(107).
018000 01  UNDER-LINE.
018100   02 FILLER           PIC X(10).
018200   02 UL-1.
018300     03 UL-2           PIC X(5).
018400     03 UL-3           PIC X(22).
018500     03 FILLER         PIC X(83).
018600 WORKING-STORAGE SECTION.
018700 01  NOW-DATE    PIC X(8).
018800 01  DATE-IN     PIC  X(8).
018900 01  HEADLINE-1        PIC X(120) VALUE "
019000-    "        U N I V E R S I T Y    O F    L A N C A S T E R
019100-    "                                  ".
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Cont.

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019200 01  HEADLINE-2       PIC X(120) VALUE "
019300-    "                ----------------------------------------
019400-    "                                                        "
019500 01  HEADLINE-3       PIC X(120) VALUE "
019600-    "                S H O R T   L O A N   C O L L E C T I O N
019700-    "                                                        "
019800 01  HEADLINE-4       PIC X(120) VALUE "
019900-    "                ----------------------------------------
020000-    "                                                        "
020100 01  HEADLINE-5       PIC X(120) VALUE "
020200-    "                IN   C O U R S E - C O D E   O R D E R
020300-    "                                                        "
020600 01  HEADLINE-6       PIC X(120) VALUE "
020500-    "                ----------------------------------------
020600-    "                                                        "
020700 01  DEPT-COURSE.
020800   02 DEPT-BUFF        PIC X(4).
020900   02 COURSE-BUFF      PIC X(3).
021000 01  DEPARTMENT.
021100   02 DEPT-NUM.
021200     03 A-HI           PIC X(4) VALUE "A.HI".
021300     03 B-DN           PIC X(4) VALUE "B.DN".
021400     03 B-OR           PIC X(4) VALUE "BF.O".
021500     03 BIOL           PIC X(4) VALUE "BIOL".
021600     03 CELL           PIC X(4) VALUE "CELL".
021700     03 CHEM           PIC X(4) VALUE "CHEM".
021800     03 C-PH           PIC X(4) VALUE "C.PH".
021900     03 CLAS           PIC X(4) VALUE "CLAS".
022000     03 C-ST           PIC X(4) VALUE "C.ST".
022100     03 CZEC           PIC X(4) VALUE "CZEC".
022200     03 ECON           PIC X(4) VALUE "ECON".
022300     03 ED-S           PIC X(4) VALUE "ED.S".
022400     03 E-GR           PIC X(4) VALUE "E.GR".
022500     03 E-MA           PIC X(4) VALUE "E.MA".
022600     03 ENGR           PIC X(4) VALUE "ENGR".
022700     03 ENGL           PIC X(4) VALUE "ENGL".
022800     03 ENVI           PIC X(4) VALUE "ENV.".
022900     03 F-CL           PIC X(4) VALUE "F.CL".
023000     03 FREN           PIC X(4) VALUE "FRFN".
023100     03 FENGL          PIC X(4) VALUE "F/FN".
023200     03 FRLA           PIC X(4) VALUE "F/LA".
023300     03 GREK           PIC X(4) VALUE "GRK.".
023400     03 HIST           PIC X(4) VALUE "HIST".
023500     03 H-SC           PIC X(4) VALUE "H.SC".
023600     03 H-AR           PIC X(4) VALUE "H.AR".
023700     03 I-MA           PIC X(4) VALUE "I.MA".
023800     03 LATN           PIC X(4) VALUE "LAT.".
023900     03 LAW            PIC X(4) VALUE "LAW.".
024000     03 LIBR           PIC X(4) VALUE "LIB.".
024100     03 LING           PIC X(4) VALUE "LING".
024200     03 MKTG           PIC X(4) VALUE "MKTG".
024300     03 M-LE           PIC X(4) VALUE "M.LE".
024400     03 MATH           PIC X(4) VALUE "MATH".
024500     03 MA-M           PIC X(4) VALUE "MA.M".
024600     03 M-PH           PIC X(4) VALUE "M.PH".
024700     03 MUSC           PIC X(4) VALUE "MUSC".
024800     03 OP-R           PIC X(4) VALUE "OP.R".
024900     03 PHIL           PIC X(4) VALUE "PHIL".
025000     03 PHYS           PIC X(4) VALUE "PHYS".
025100     03 POLI           PIC X(4) VALUE "POLI".
025200     03 Q-PH           PIC X(4) VALUE "Q.PH".
025300     03 R-ST           PIC X(4) VALUE "R.ST".
025400     03 RUSS           PIC X(4) VALUE "RUSS".
025500     03 SOCL           PIC X(4) VALUE "SOCL".
025600     03 S-PN           PIC X(4) VALUE "S.PN".
025700     03 R-NL           PIC X(4) VALUE "R.NL".
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025800   03 GERM            PIC X(4) VALUE "GERM".
025900   02 DEPT-NO     REDEFINES  DEPT-NUM.
026000   03 DEPT            PIC X(4)  OCCURS  47 TIMES.
026100 01  DEPART-NAME.
026200   02 DEPT-NAME.
026300   03 DN-1            PIC X(65)   VALUE "A N C I E N T   H I S T O
026400-    " R Y.
026500   03 DN-2            PIC X(65)   VALUE "B A S I C   D E S I G N.
026600-    "
026700   03 DN-45           PIC X(65)   VALUE "B E H A V I O U R   I N
026800-    " O R G A N I Z A T I O N S .
026900   03 DN-3            PIC X(65)   VALUE "B I O L O G Y.
027000-    "
027100   03 DN-4            PIC X(65)   VALUE "C E L L U L A R   P H Y S
027200-    " I O L O G Y.
027300   03 DN-5            PIC X(65)   VALUE "C H E M I S T R Y.
027400-    "
027500   03 DN-6            PIC X(65)   VALUE "C L A S S I C A L   P H Y
027600-    " S I C S.
027700   03 DN-7            PIC X(65)   VALUE "C L A S S I C S.
027800-    "
027900   03 DN-8            PIC X(65)   VALUE "C O M P U T E R   S T U D
028000-    " I E S.
028100   03 DN-9            PIC X(65)   VALUE "C Z E C H O S L O V A K I
028200-    "A N   S T U D I E S.
028300   03 DN-10           PIC X(65)   VALUE "E C O N O M I C S.
028600-    "
028500   03 DN-11           PIC X(65)   VALUE "E D U C A T I O N A L   S
028600-    " T U D I E S.
028700   03 DN-12           PIC X(65)   VALUE "E L E M E N T A R Y   G R
028800-    " E E K.
028900   03 DN-13           PIC X(65)   VALUE "E L E M E N T A R Y   M A
029000-    " T H E M A T I C S.
029100   03 DN-14           PIC X(65)   VALUE "E N G I N E E R I N G.
029200-    "
029300   03 DN-15           PIC X(65)   VALUE "E N G L I S H.
029400-    "
029500   03 DN-16           PIC X(65)   VALUE "E N V I R O N M E N T A L
029600-    "   S C I E N C E S.
029700   03 DN-17           PIC X(65)   VALUE "F I N A N C I A L   C O N
029800-    " T R O L.
029900   03 DN-18           PIC X(65)   VALUE "F R E N C H.
030000-    "
030100   03 DN-19           PIC X(65)   VALUE "F R E N C H / E N G L I S
030200-    "H.
030300   03 DN-20           PIC X(65)   VALUE "F R E N C H / L A T I N.
030400-    "
030500   03 DN-21           PIC X(65)   VALUE "G R E E K.
030600-    "
030700   03 DN-22           PIC X(65)   VALUE "H I S T O R Y.
030800-    "
030900   03 DN-23           PIC X(65)   VALUE "H I S T O R Y   O F   S
031000-    "C I E N C E.
031100   03 DN-24           PIC X(65)   VALUE "H I S T O R Y   O F   M
031200-    "E D I E V A L   A R C H I T E C T U R E.
031300   03 DN-25           PIC X(65)   VALUE "I N T R O D U C T O R Y
031400-    " M A T H E M A T I C S.
031500   03 DN-26           PIC X(65)   VALUE "I A T I N.
031600-    "
031700   03 DN-27           PIC X(65)   VALUE "I A W.
031800-    "
031900   03 DN-44           PIC X(65)   VALUE "LIBRARY. OWN COPY.
032000-    "
032100   03 DN-28           PIC X(65)   VALUE "L I N G U I S T I C S.
032200-    "
032300   03 DN-29           PIC X(65)   VALUE "M A R K E T I N G.
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032400-    "                                                    .
032500     03 DN-30              PIC X(65)   VALUE "M A R X I S M    A N D
032600-      "L E N I N I S M.                                  .
032700     03 DN-31              PIC X(65)   VALUE "M A T H E M A T I C S.
032800-    "                                                    .
032900     03 DN-32              PIC X(65)   VALUE "M A T H E M A T I C A L
033000-      " M E T H O D S.                                   .
033100     03 DN-33              PIC X(65)   VALUE "M O D E R N     P H Y S I
033200-      "C S.                                              .
033300     03 DN-34              PIC X(65)   VALUE "M U S I C.
033400-    "                                                    .
033500     03 DN-35              PIC X(65)   VALUE "O P E R A T I O N    R E S
033600-      " E A R C H.                                       .
033700     03 DN-36              PIC X(65)   VALUE "P H I L O S O P H Y.
033800-    "                                                    .
033900     03 DN-37              PIC X(65)   VALUE "P H Y S I C S.
034000-    "                                                    .
034100     03 DN-38              PIC X(65)   VALUE "P O L I T I C S.
034200-    "                                                    .
034300     03 DN-39              PIC X(65)   VALUE "Q U A N T U M    P H Y S I
034400-      "C S.                                              .
034500     03 DN-40              PIC X(65)   VALUE "R E L I G I O U S    S T U
034600-      " D I E S.                                         .
034700     03 DN-41              PIC X(65)   VALUE "R U S S I A N    A N D
034800-      "S O V I E T    S T U D I E S.                     .
034900     03 DN-42              PIC X(65)   VALUE "S O C I O L O G Y.
035000-    "                                                    .
035100     03 DN-46              PIC X(65)   VALUE "S Y S T E M S  E N G I N E
035200-      " E R I N G.                                       .
035300     03 DN-43              PIC X(65)   VALUE "R U S S I A N    ( N O N -
035400-      " L A N G U A G E ).                               .
035500     03 DN-47              PIC X(65)   VALUE "G E R M A N   S T U D I E
035600-      "S.                                                .
035700   02 DEPT-NAME-1 REDEFINES DEPT-NAME.
035800     03 NAME               PIC X(65)   OCCURS  47  TIMES.
035900 01  MARKER        PIC X    VALUE IS  "+".
036000 01  K              PIC 9(4) COMP SYNC RIGHT VALUE 1.
036100 01  J  PIC 9(4) COMP SYNC RIGHT VALUE 0.
036200 01  P         PIC 9(4) COMP SYNC RIGHT VALUE 1.
036300 01  ARROW    PIC X VALUE IS "+".
036400 01  RECORD-STORE.
036500   02 RS-1.
036600     03 CH PIC X OCCURS 98 TIMES.
036700   02 RS-2     PIC 99.
036800   02 RS-3     PIC X(11).
036900   02 RS-4     PIC X.
037000   02 RS-5     PIC X(7).
037100 01  LETTERING-7  PIC X(36) VALUE IS       "*********************
037200-      "  **********".
037300 01  LETTERING-6  PIC X(36) VALUE IS       "A M M E N D M E N T
037400-      "  S H E E T S".
037500 01  N              PIC 9(4)  COMP SYNC RIGHT VALUE 1.
037600 01  M              PIC 9(4)  COMP SYNC RIGHT VALUE 1.
037700 01  LETTERING-2A PIC X(12) VALUE IS "A U T H O R.".
037800
037900 01  LETTERING-2T PIC X(10) VALUE IS "T I T L E.".
038000 01  LETTERING-3 PIC X(4)  VALUE IS "COPY".
038100 01  LETTERING-4   PIC X(9)  VALUE IS "CLASSMARK".
038200 01  LETTERING-5   PIC X(11) VALUE IS "COURSE-CODE".
038300 01  SPACEFIND     PIC 9(4)  COMP SYNC RIGHT VALUE 0.
038400 01  SHEET-COUNT   PIC 9(2)  COMP SYNC RIGHT VALUE 1.
038500 01  LETTERING-1   PIC X(56) VALUE IS "UNIVERSITY   OF   LANCASTER
038600-      "  SHORT   LOAN   COLLECTION.".
038700 01  SLASH         PIC X VALUE IS "/".
038800 01  SHEET         PIC X(6) VALUE IS "SHEET ".
038900 01  LINE-COUNT    PIC 9(4) COMP SYNC RIGHT VALUE IS ZERO.
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039000 01  ONE                  PIC 9(4)  COMP SYNC RIGHT VALUE 1.
039100 01  DEPT-BUFFER          PIC X(65).
039200 01  DASHES               PIC X(3)  VALUE "---".
039300 01  TITLE-LINE           PIC X(120)  VALUE "                                                    A U
039400-     " T H O R - T I T L E                                                                      COP
039500-     "Y      CLASSIFY        EXPIRY-CODE ".
039600 01  LOOP-NUMB            PIC 9(4)  COMP SYNC RIGHT VALUE ZERO.
039700 01  COPY-COUNT           PIC 9(4)  COMP SYNC RIGHT VALUE ZERO.
039800 01  CSAW-LENGTH          PIC 1(24)  VALUE 21.
039900 01  CSAW-KEY.
040000   02 KEY-LENGTH          PIC 1(8)   VALUE 67.
040100   02 KEY-WORD            PIC 1(15)  VALUE 1.
040200 01  CSAW-RECORD.
040300   02 UC                  PIC 1(24)  VALUE 21.
040400   02 CSAW-R1.
040500     03 R1-CONO           PIC X(7).
040600     03 R1-AUTT           PIC  X(58).
040700     03 R1-COUU           PIC  99.
040800     03 R1-CLUA           PIC X(11).
040900     03 R1-EXCO           PIC  X.
041000     03 R1-FILLER         PIC X.
041100 01  CSAW-NAME            PIC  X(12)  VALUE "RLCOURSESORT".
041200 01  CSAW-GEN-NO          PIC 1(24)  VALUE  0.
041300 01  CSAW-RET-PD          PIC  1(24)  VALUE  999.
041400 PROCEDURE DIVISION.
041500 START.
041600     OPEN INPUT IN-CARD.
041700     READ IN-CARD AT END GO TO WRAP-UP.
041800     MOVE CHAR-C TO COPY-COUNT.
041900     READ IN-CARD AT END GO TO WRAP-UP.
042000     CLOSE IN-CARD.
042100 START-UP.
042200     OPEN INPUT IN-TAPE
042300          OUTPUT OUT-PRINT.
042400     IF SELECT-PRINT OPEN INPUT  INFO-IN.
042500     IF SELECT-PRINT READ INFO-IN    AT END GO TO WRAP-UP.
042600     IF INFO(K)  = "*" GO TO WRAP-UP.
042700     ACCEPT NOW-DATE FROM RUN-DATE.
042800     MOVE ARROW TO CH(1).
042900 ZZZ.
043000     MOVE SPACES TO HEADING.
043100     MOVE ALL SPACES TO DATE-LINE.
043200     MOVE ALL SPACES TO DEPT-LINE.
043300     MOVE ALL SPACES TO COURSE-LINE.
043400     MOVE ALL SPACES TO UNDER-LINE.
043500     MOVE ALL SPACES TO OUTHEAD.
043600     MOVE ALL SPACES TO HEADLINE-1A.
043700     MOVE ALL SPACES TO HEADLINE-2A.
043800     MOVE ALL SPACES TO HEADLINE-3A.
043900     MOVE ALL SPACES TO HEADLINE-4A.
044000 ZZZ-1.
044100     MOVE ALL SPACES TO PRINT-NORM.
044200     MOVE ALL SPACES TO PRINT-SPEC.
044300     MOVE ALL SPACES TO PRINTLINE.
044400     MOVE ALL SPACES TO SPEC-LINE.
044500 SELECT-OUT-1.
044600     MOVE   HEADLINE-1 TO OUTHEAD.
044700     WRITE OUTHEAD AFTER CHANNEL-3.
044800     MOVE   HEADLINE-2 TO OUTHEAD.
044900     WRITE OUTHEAD AFTER ADVANCING 1  LINES.
045000     MOVE   HEADLINE-3 TO OUTHEAD.
045100     WRITE OUTHEAD AFTER ADVANCING 10 LINES.
045200     MOVE   HEADLINE-4 TO OUTHEAD.
045300     WRITE OUTHEAD AFTER ADVANCING 1  LINES.
045400     PERFORM ZZZ.
045500     MOVE NOW-DATE   TO H-1-1.
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045600      WRITE HEADLINE-1A  AFTER ADVANCING 4 LINES.
045700      PERFORM ZZ7.
045800      IF SELECT-PRINT PERFORM SELECT-OUT-2.
045900      PERFORM ZZ7.
046000 FIRST-REC-S.
046100      READ IN-TAPE AT END GO TO WRAP-UP.
046200      IF STAT-CHAR = "7777" GO TO WRAP-UP.
046300      IF SELECT-PRINT GO TO FIND-CHAR.
046400 MAIN-LOOP-S.
046500      IF AUTI-1 = CH(1) GO TO MAIN-LOOP-2-S.
046600      IF CH(1) = ARROW GO TO MAIN-LOOP-S1.
046700 MAIN-LOOP-1-S.
046800      ADD 1 TO SPACEFIND.
046900      IF  CH(SPACEFIND) = SPACE GO TO FIRST-ONE-S.
047000      IF SPACEFIND  > 57 GO TO PUT-OUT-S.
047100      GO TO MAIN-LOOP-1-S.
047200 FIND-CHAR.
047300      IF AUTI-1 = INFO(K)     GO TO MAIN-LOOP-S.
047400      IF MARKER = ARROW GO TO FIRST-REC-S.
047500      ADD 1 TO K.
047600      IF K > 7 READ INFO-IN AT END GO TO WRAP-UP.
047700      IF K > 7  MOVE ONE TO K.
047800      IF INFO(K)  = "*" GO TO WRAP-UP.
047900      MOVE ARROW TO MARKER.
048000      GO TO FIND-CHAR.
048100 MAIN-LOOP-S1.
048200      PERFORM CCC THRU THROW-PAGE.
048300      GO TO FIRST-REC-S.
048400 FIRST-ONE-S.
048500      ADD 1 TO SPACEFIND.
048600      IF CH(SPACEFIND) = SPACE GO TO PUT-OUT-1-S.
048700      GO TO MAIN-LOOP-1-S.
048800 PUT-OUT-1-S.
048900      SUBTRACT 2 FROM SPACEFIND.
049000 PUT-OUT-S.
049100      MOVE ONE TO SHEET-COUNT.
049200      IF SPACEFIND > 25 GO TO OUT-SPECIAL-S1.
049300 AAA-S.
049400      MOVE CH(N) TO AU-FIELD(N).
049500      ADD 1 TO N.
049600      IF N > SPACEFIND GO TO FILL-SPACE-S.
049700      GO TO AAA-S.
049800 FILL-SPACE-S.
049900      MOVE SPACE TO AU-FIELD(N).
050000      ADD 1 TO N.
050100      IF N > 29 GO TO TITLE-1-S.
050200      GO TO FILL-SPACE-S.
050300 TITLE-1-S.
050400      ADD 2 TO SPACEFIND.
050500      MOVE SPACEFIND TO N.
050600 TITLE-2-S.
050700      MOVE CH(N) TO TI-FIELD(M).
050800      ADD 1 TO N.
050900      IF N > 57 GO TO COP-OUT-S-1.
051000      ADD 1 TO M.
051100      GO TO TITLE-2-S.
051200 COP-OUT-S-1.
051300      PERFORM COP-OUT-S.
051400      IF RS-4  = CHAR-1 MOVE ARROW TO AR3-1.
051500      IF RS-4 NOT = CHAR-0 GO TO BBB-1.
051600      MOVE ARROW TO ARR-1.
051700 BBB-1.
051800      PERFORM BBB THRU  CCC.
051900      PERFORM THROW-PAGE.
052000      GO TO FIRST-REC-S.
052100 MAIN-LOOP-2-S.
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052200      IF SELECT-PRINT MOVE SLASH TO MARKER.
052300      IF LINE-COUNT = 50 GO TO NEW-PAGE-S.
052400      ADD 1 TO SPACEFIND.
052500      IF CH(SPACEFIND) = SPACE GO TO FIRST-ONE-1-S.
052600      IF SPACEFIND > 47 GO TO PUT-OUT-2-S.
052700      GO TO MAIN-LOOP-2-S.
052800 FIRST-ONE-1-S.
052900      ADD 1 TO SPACEFIND.
053000      IF CH(SPACEFIND) = SPACE GO TO PUT-OUT-3-S.
053100      GO TO MAIN-LOOP-2-S.
053200 PUT-OUT-3-S.
053300      SUBTRACT 2 FROM SPACEFIND.
053400 PUT-OUT-2-S.
053500      IF SPACEFIND  > 57 SUBTRACT 2 FROM SPACEFIND.
053600      IF SPACEFIND > 25 GO TO OUT-SPECIAL-S.
053700 AAA-1-S.
053800      MOVE CH(N) TO AU-FIELD(N).
053900      ADD 1 TO N.
054000      IF N > SPACEFIND GO TO FILL-SPACE-1-S.
054100      GO TO AAA-1-S.
054200 FILL-SPACE-1-S.
054300      MOVE SPACE TO AU-FIELD(N).
054400      ADD 1 TO N.
054500      IF N > 29 GO TO TITLE-1-1-S.
054600      GO TO FILL-SPACE-1-S.
054700 TITLE-1-1-S.
054800      ADD 2 TO SPACEFIND.
054900      MOVE SPACEFIND TO N.
055000 TITLE-2-1-S.
055100      MOVE CH(N) TO TI-FIELD(M).
055200      ADD 1 TO N.
055300      IF N > 57 GO TO COP-OUT-1-S.
055400      ADD 1 TO M.
055500      GO TO TITLE-2-1-S.
055600 COP-OUT-1-S.
055700      PERFORM COP-OUT-S.
055800      IF RS-4  = CHAR-1 MOVE ARROW TO ARR-1.
055900      IF RS-4 NOT = CHAR-0 GO TO BBB-1-S.
056000      MOVE ARROW TO ARR-1.
056100 BBB-1-S.
056200      PERFORM BBB THRU BCC.
056300 YY.
056400      GO TO FIRST-REC-S.
056500 NEW-PAGE-S.
056600      ADD 1 TO SHEET-COUNT.
056700      PERFORM THROW-PAGE.
056800      MOVE ALL ZEROS TO LINE-COUNT.
056900      GO TO MAIN-LOOP-2-S.
057000 OUT-SPECIAL-S1.
057100      MOVE ZERO  TO P.
057200 OUT-SPECIAL-S.
057300      MOVE CH(N) TO AT1-SPEC(N).
057400      ADD 1 TO N.
057500      IF N > SPACEFIND GO TO MAKE-SPACE.
057600      GO TO OUT-SPECIAL-S.
057700 MAKE-SPACE.
057800      IF N > 57 GO TO YYY.
057900      MOVE SPACE TO AT1-SPEC(N).
058000      ADD 1 TO J. ADD 1 TO N.
058100      IF J = 6 GO TO TITLE1-1.
058200      GO TO MAKE-SPACE.
058300 TITLE1-1.
058400      MOVE N TO M.
058500      SUBTRACT 6 FROM N.
058600 TITLE1-2.
058700      MOVE CH(N) TO AT1-SPEC(M).
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058800      ADD 1 TO N. ADD 1 TO M.
058900      IF N > 58 GO TO YYY.
059000      GO TO TITLE1-2.
059100 YYY.
059200      PERFORM COP-OUT-SPEC.
059300      IF P = ZERO  GO TO SPECIAL-END.
059400      GO TO YY.
059500 SPECIAL-END.
059600      PERFORM THROW-PAGE.
059700      MOVE ONE  TO P.
059800      GO TO FIRST-REC-S.
059900 COP-OUT-SPEC.
060000      MOVE RS-2 TO CONU-SPE.
060100      MOVE RS-3 TO CLMA-SPE.
060200      MOVE RS-5 TO CONO-SPE.
060300      IF RS-4 = CHAR-0 MOVE ARROW TO ARR-1-8.
060400      IF RS-4  = CHAR-1 MOVE ARROW TO ARR-1-S.
060500      WRITE SPEC-LINE AFTER ADVANCING 1 LINES.
060600      PERFORM ZZ7-1.
060700      ADD 1 TO LINE-COUNT.
060800      MOVE ONE TO N.
060900      MOVE ONE TO M.
061000      MOVE ZERO TO SPACEFIND.
061100      MOVE ZERO TO J.
061200      PERFORM CCC.
061300 SSB.
061400      WRITE PRINTLINE AFTER ADVANCING 1 LINES.
061500      PERFORM ZZZ-1.
061600      ADD 1 TO LINE-COUNT.
061700      MOVE ONE TO N.
061800      MOVE ONE TO M.
061900      MOVE ZERO TO SPACEFIND.
062000      MOVE ZERO TO J.
062100 CCC.
062200      MOVE AUTI  TO RS-1.
062300      MOVE CONU  TO RS-2.
062400      MOVE CLMA  TO RS-3.
062500      MOVE EXCO  TO RS-4.
062600      MOVE CONO  TO RS-5.
062700 THROW-PAGE.
062800      MOVE LETTERING-1 TO H-2-1.
062900      MOVE NOW-DATE   TO  H-2-3.
063000      MOVE  SHEET TO  H-2-8
063100      MOVE  ALL ZEROS TO LINE-COUNT.
063200      MOVE         CH(1)  TO H-2-9.
063300      MOVE SHEET-COUNT  TO  H-2-10.
063400      WRITE HEADLINE-2A AFTER CHANNEL-1.
063500      PERFORM ZZZ.
063600      MOVE LETTERING-2A TO H3-AUTHOR.
063700      MOVE LETTERING-2T TO H3-TITLE.
063800      MOVE LETTERING-3 TO H3-CONU.
063900      MOVE LETTERING-4 TO H3-CLMA.
064000      MOVE LETTERING-5 TO H3-CONO.
064100      WRITE HEADLINE-3A AFTER ADVANCING 2 LINES.
064200      PERFORM ZZ7.
064300      MOVE SPACES TO H3-AUTHOR.
064400      MOVE SPACES TO H3-TITLE.
064500      MOVE SPACES TO H3-CONU.
064600      MOVE SPACES TO H3-CLMA.
064700      MOVE SPACES TO H3-CONO.
064800      WRITE HEADLINE-3A AFTER ADVANCING 4 LINES.
064900      PERFORM ZZ7.
065000 COP-OUT-8.
065100      MOVE RS-2 TO CONU-1.
065200      MOVE RS-3 TO CLMA-1.
065300      MOVE RS-5 TO CONO-1.
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065400 SELECT-OUT-2.
065500     MOVE LETTERING-A TO H-4-1.
065600     WRITE  HEADLINE-4A AFTER ADVANCING 4 LINES.
065700     MOVE LETTERING-7 TO H-4-1.
065800     WRITE  HEADLINE-4A AFTER ADVANCING 1 LINES.
065900 WRAP-UP.
066000     CLOSE OUT-PRINT  IN-TAPE.
066100     IF SELECT-PRINT  CLOSE INFO-IN.
066200     ADD 1 TO LOOP-NUMB.
066300     IF LOOP-NUMB  <  COPY-COUNT  GO TO START-UP.
066400     IF COURSE-PRINT GO TO OUT-COURSE.
066500     GO TO FIN-9.
066600 OUT-COURSE.
066700     ACCEPT  DATE-IN FROM RUN-DATE.
066800     OPEN INPUT IN-CARD.
066900     READ IN-CARD AT END GO TO FIN.
067000     MOVE ZERO TO LOOP-NUMB.
067100     MOVE CHAR-C TO COPY-COUNT.
067200     CLOSE IN-CARD.
067300     OPEN INPUT IN-TAPE.
067400 READ-A-RECORD.
067500     READ IN-TAPE AT END GO TO LAST-RECORD.
067600     MOVE AUTI TO R1-AUTI.
067700     MOVE CONU TO R1-CONU.
067800     MOVE CLNA TO R1-CLNA.
067900     MOVE EXCO TO R1-EXCO.
068000     MOVE CONO TO R1-CONO.
068100 CSAW-ENTER.
068200     ENTER PLAN CSAU USING CSAW-LENGTH, CSAW-KEY, CSAW-RECORD.
068300     CSAW-NAME, CSAW-GEN-NO, CSAW-RET-PD.
068400 CSAW-END.
068500     GO TO READ-A-RECORD.
068600 LAST-RECORD.
068700     MOVE ZERO TO CSAW-LENGTH.
068800     PERFORM CSAW-ENTER.
068900     MOVE ONE TO J.
069000 START-UP-1.
069100     OPEN INPUT COURSE-TAPE OUTPUT OUT-PRINT.
069200     MOVE SPACES TO HEADING.
069300     WRITE HEADING AFTER CHANNEL-4.
069400     MOVE HEADLINE-1 TO HEADING.
069500     WRITE HEADING AFTER CHANNEL-3.
069600     MOVE HEADLINE-2 TO HEADING.
069700     WRITE HEADING AFTER ADVANCING 1 LINES.
069800     MOVE HEADLINE-3 TO HEADING.
069900     WRITE HEADING AFTER ADVANCING 4 LINES.
070000     MOVE HEADLINE-4 TO HEADING.
070100     WRITE HEADING AFTER ADVANCING 1 LINES.
070200     MOVE HEADLINE-5 TO HEADING.
070300     WRITE HEADING AFTER ADVANCING 4 LINES.
070400     MOVE HEADLINE-6 TO HEADING.
070500     WRITE HEADING AFTER ADVANCING 1 LINES.
070600     PERFORM ZZZ.
070700     MOVE DATE-IN TO DL-1.
070800     WRITE DATE-LINE AFTER ADVANCING 4 LINES.
070900     PERFORM ZZZ.
071000     IF SELECT-PRINT PERFORM SELECT-OUT-2.
071100     PERFORM ZZZ.
071200     WRITE HEADING AFTER CHANNEL-1.
071300     IF SELECT-PRINT OPEN INPUT INFO-IN.
071400 START-LOOP.
071500     IF SELECT-PRINT GO TO SELECT-LOOP.
071600 START-IN.
071700     IF SELECT-PRINT  READ INFO-IN AT END GO TO FIN.
071800     READ COURSE-TAPE AT END GO TO FIN.
071900     IF SELECT-PRINT GO TO FIND-DEPT.
```

Cont.

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072000 LOOP-1.
072100     MOVE CONO-C TO DEPT-COURSE.
072200     MOVE ONE TO  N.
072300 A2.
072400     IF DEPT(N) = CO-1 GO TO A1.
072500     ADD 1 TO N.
072600     IF N   >  67 GO TO ERROR-1.
072700     GO TO A2.
072800 SELECT-LOOP.
072900     READ INFO-IN AT END GO TO FIN.
073000     IF INFO-A = "))))))))" GO TO START-IN.
073100     GO TO SELECT-LOOP.
073200 FIND-DEPT.
073300     IF INFO-A  = CONO-C GO TO LOOP-1.
073400     READ COURSE-TAPE AT END GO TO FIN.
073500     GO TO FIND-DEPT.
073600 A1.
073700     MOVE  NAME(N) TO  DEPT-BUFFER.
073800 LOOP-2.
073900     MOVE  DEPT-BUFFER TO DEPT-1.
074000     WRITE DEPT-LINE AFTER CHANNEL-2.
074100     PERFORM ZZZ.
074200     MOVE ONE TO LINE-COUNT.
074300     MOVE CO-2 TO COURSE-1.
074400     WRITE COURSE-LINE AFTER ADVANCING 4 LINES.
074500     PERFORM ZZZ.
074600     MOVE DASHES TO UL-2.
074700     MOVE SPACES TO UL-3.
074800     WRITE UNDER-LINE AFTER ADVANCING 1 LINES.
074900     PERFORM ZZZ.
075000     MOVE TITLE-LINE TO HEADING.
075100     WRITE HEADING AFTER ADVANCING    4 LINES.
075200     PERFORM ZZZ.
075300 LOOP-3.
075400     IF AUTI-C(M)  = SPACE GO TO FOUND-FIRST.
075500     ADD 1 TO M.
075600     IF M > 58 GO TO OUT-SPEC.
075700     GO TO LOOP-3.
075800 FOUND-FIRST.
075900     ADD 1 TO M.
076000     IF AUTI-C(M) = SPACE GO TO FOUND-SECOND.
076100     GO TO LOOP-3.
076200 FOUND-SECOND.
076300     IF M > 27 GO TO OUT-SPEC.
076400     MOVE M TO P.
076500     SUBTRACT 2 FROM P.
076600 AA.
076700     MOVE AUTI-C(J) TO  AUTHOR-1(J).
076800     ADD 1 TO J.
076900     IF J  > P GO TO C-BBB.
077000     GO TO AA.
077100 C-BBB.
077200     MOVE ONE TO J.
077300 C-BBB-1.
077400     MOVE AUTI-C(M) TO TITLE-1(J).
077500     ADD 1 TO M.
077600     IF M > 58 GO TO C-CCC.
077700     ADD 1 TO J.
077800     IF J > 49 GO TO C-CCC.
077900     GO TO C-BBB-1.
078000 C-CCC.
078100     MOVE CONU-C  TO CONU-1-C.
078200     MOVE CLHA-C  TO CLHA-1-C.
078300     MOVE EXCO-C  TO EXCO-1-C.
078400     WRITE  PRINT-NORM AFTER ADVANCING 2 LINES.
078500 DDD.
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Cont.

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078600      PERFORM ZZZ-1.
078700      MOVE ONE TO M.
078800      MOVE ONE TO J.
078900      MOVE  ONE TO P.
079000      ADD 1 TO LINE-COUNT.
079100      IF  LINE-COUNT = 24  PERFORM LOOP-2.
079200      READ COURSE-TAPE AT END GO TO FIN.
079300      IF     CONO-C =  DEPT-COURSE  GO TO LOOP-3.
079400      IF SELECT-PRINT READ INFO-IN AT END GO TO FIN.
079500      IF SELECT-PRINT GO TO FIND-DEPT.
079600      IF     CO-1    =  DEPT-BUFF    GO TO XXX.
079700      GO TO LOOP-1.
079800 OUT-SPEC.
079900      IF M >  58 SUBTRACT 1 FROM  M.
080000      MOVE AUTI-C(J)  TO AUTI-2-S(J).
080100      ADD 1 TO J.
080200      IF J = M GO TO  NEXT-PART.
080300      GO TO OUT-SPEC.
080400 NEXT-PART.
080500      MOVE SPACE TO AUTI-2-S(J).
080600      ADD 1 TO P.
080700      IF P = 6 GO TO  TITLE-PART.
080800      ADD 1 TO J.
080900      GO TO NEXT-PART.
081000      IF M > 57  GO TO COPY-PART.
081100 TITLE-PART.
081200      MOVE AUTI-C(M) TO AUTI-2-S(J).
081300      ADD 1 TO M.
081400      IF M > 58 GO TO COPY-PART.
081500      GO TO TITLE-PART.
081600 COPY-PART.
081700      MOVE  CONU-C  TO  CONU-2.
081800      MOVE  CLMA-C  TO  CLMA-2.
081900      MOVE  EXCO-C  TO  EXCO-2.
082000      WRITE PRINT-SPEC AFTER ADVANCING 2 LINES.
082100      GO TO ADD.
082200 XXX.
082300      MOVE CONO-C TO DEPT-COURSE.
082400      GO TO LOOP-2.
082500 ERROR-1.
082600      DISPLAY  "DEPARTMENT NOT FOUND", CO-1.
082700      READ COURSE-TAPE AT END GO TO FIN.
082800      GO TO LOOP-1.
082900 FIN.
083000      CLOSE OUT-PRINT   COURSE-TAPE.
083100      IF SELECT-PRINT  CLOSE INFO-IN.
083200      ADD 1 TO LOOP-NUMB.
083300      IF LOOP-NUMB  <  COPY-COUNT  GO TO START-UP-1.
083400 FIN-0.
083500      STOP "END OF JOB".
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Appendix D

Listing of #SLPX

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   1900 COBOL COMPILER #XE20 UX. 4      COBOL SOURCE FILE    DATE 70/06/71    TIME 24/00/00

COMPILER SEQUENCING
000100 IDENTIFICATION DIVISION.
000200      PROGRAM-ID.  SLPX50.
000300      ENVIRONMENT DIVISION.
000400      CONFIGURATION SECTION.
000500      SOURCE-COMPUTER.  ICT-1005.
000600      OBJECT-COMPUTER.  ICT-1005, MEMORY 10000 WORDS.
000700      INPUT-OUTPUT SECTION.
000800      FILE-CONTROL.
000900      SELECT  IN-CARD ASSIGN TO CARD-READER 1.
001000      SELECT  IN-TAPE ASSIGN TO 1 TAPES.
001100      SELECT  EXP-TAPE ASSIGN TO 1 TAPES.
001200      SELECT  OUT-PRINT ASSIGN  TO  1 PRINTER.
001300 DATA DIVISION.
001400 FILE SECTION.
001500 FD  IN-TAPE BLOCK CONTAINS 2048 CHARACTERS
001600                 LABEL RECORDS STANDARD
001700               VALUE OF ID IS "SLAUTHORSORT"
001800               DATA RECORD IS IN-RECORD.
001900 01  IN-RECORD.
002000     02 UC                PIC  1(24).
002100     02 AUTI              PIC  X(58).
002200     02 CONU              PIC  99.
002300     02 CLNA              PIC  X(11).
002400     02 EXCO              PIC  X.
002500     02 COND              PIC  X(7).
002600     02 FILLER            PIC  X.
002700 FD  EXP-TAPE      BLOCK CONTAINS 2048 CHARACTERS
002800                  LABEL RECORDS STANDARD
002900                  VALUE OF ID IS "SLEXPINVSORT"
003000                  DATA RECORD IS  EXP-RECORD.
003100 01  EXP-RECORD.
003200     02 UC                PIC  1(24).
003300        02 CLNA-E              PIC  X(11).
003400     02 AUTI-E            PIC  X(58).
003500        02 CONU-E              PIC  99.
003600     02 EXCO-E            PIC  X.
003700     02 COND-E            PIC  X(7).
003800     02 FILLER            PIC  X.
003900 FD  OUT-PRINT     LABEL RECORDS ARE OMITTED
004000                  DATA RECORD IS PRINT-LINE.
004100 01  PRINT-LINE.
004200     02 FILLER            PIC X(10).
004300     02 CLASS-P           PIC X(11).
004400     02 FILLER            PIC X(10).
004500     02 AUTHOR-TITLE      PIC X(58).
004600     02 FILLER            PIC X(6).
004700     02 COD-NUMB          PIC 99.
004800     02 FILLER            PIC X(3).
004900     02 COURSE-NUMB       PIC X(7).
005000     02 FILLER            PIC X(3).
005100 FD  IN-CARD       BLOCK CONTAINS 80 CHARACTERS
005200                  LABEL RECORDS ARE OMITTED
005300                  DATA RECORD IS DATA-CARD.
005400 01  DATA-CARD.
005500     02 CH-1              PIC X.
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Cont.

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005600  02 CH-2              PIC X.
005700  02 FILLER            PIC X(78).
005800 WORKING-STORAGE SECTION.
005900 01  CSAW-LENGTH  PIC 1(24)  VALUE 24.
006000 01  CSAW-KEY.
006100  02 KEY-LENGTH   PIC 1(9)   VALUE 24.
006200  02 KEY-WORD     PIC 1(15)  VALUE 1.
006300 01  CSAW-NAME    PIC X(12)  VALUE "RLEXPIRYSORT".
006400 01  CSAW-GEN-NO  PIC 1(24)  VALUE 0.
006500 01  CSAW-RET-PD  PIC 1(24)  VALUE 200.
006600 01  CSAW-RECORD.
006700  02 WC           PIC 1(24)  VALUE 24.
006800  02 CSAW-CLASS   PIC X(11).
006900  02 CSAW-AUTI    PIC X(50).
007000  02 CSAW-CONU    PIC 99.
007100  02 CSAW-EXCO    PIC X.
007200  02 CSAW-CONO    PIC X(7).
007300  02 FILLER       PIC X.
007400 PROCEDURE DIVISION.
007500 START-UP.
007600     OPEN INPUT IN-TAPE IN-CARD.
007700     READ IN-CARD AT END GO TO FIN.
007800 READ-A-RECORD.
007900     READ IN-TAPE AT END GO TO LAST-RECORD.
008000     IF EXCO =  CH-1 GO TO  STORE-IT.
008100     IF EXCO  = CH-2 GO TO STORE-IT.
008200     GO TO READ-A-RECORD.
008300 STORE-IT.
008400     MOVE CLMA TO CSAW-CLASS.
008500     MOVE AUTI TO CSAW-AUTI.
008600     MOVE CONU TO CSAW-CONU.
008700     MOVE EXCO TO CSAW-EXCO.
008800     MOVE CONO TO CSAW-CONO.
008900 CSAW-CALL.
009000     ENTER PLAN CSAW USING CSAW-LENGTH, CSAW-KEY, CSAW-RECORD,
009100     CSAW-NAME, CSAW-GEN-NO, CSAW-RET-PD.
009200 CSAW-EXIT.
009300     GO TO READ-A-RECORD.
009400 LAST-RECORD.
009500     MOVE ZERO TO CSAW-LENGTH.
009600     PERFORM CSAW-CALL.
009700 PRINT-ROUTINE.
009800     OPEN INPUT EXP-TAPE  OUTPUT OUT-PRINT.
009900     MOVE SPACES TO PRINT-LINE.
010000     WRITE PRINT-LINE AFTER CHANNEL-1.
010100     MOVE SPACES TO PRINT-LINE.
010200     WRITE PRINT-LINE AFTER CHANNEL-1.
010300 PRINT-LOOP.
010400     READ EXP-TAPE AT END GO TO FIN-1.
010500     MOVE CLMA-E TO CLASS-P.
010600     MOVE AUTI-E TO AUTHOR-TITLE.
010700     MOVE CONU-E TO COP-NUMB.
010800     MOVE CONO-E TO COURSE-NUMB.
010900     WRITE PRINT-LINE  AFTER ADVANCING 1 LINES.
011000     GO TO PRINT-LOOP.
011100 FIN-1.
011200     CLOSE IN-CARD, OUT-PRINT, IN-TAPE WITH LOCK.
011300           EXP-TAPE WITH LOCK.
011400     STOP "END OF JOB".

011500 FIN.
011600     STOP "EXPIRY-CODE CARD MISSING".
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